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Telecommunications Forecast for ITU Region 2 to the Year 1995

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TO THE YEAR 1995

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October 1985

Page 35, under the 1980 data column, the "a" footnote for Intelsat E/S should be a "b".

Page 38 should be page 43.

Page 39 should be page 42.

Page 42 should be page 39.

Page 43 should be page 38.

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TELECOMMUNICATIONS FORECAST FOR ITU REGION 2 TO THE YEAR 1995

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SUMMARY

A study of current and future (to 1995) telecommunications activity within ITU Region 2 was performed by the Space Communications Division of NASA's Lewis Research Center. The primary objective of this study was to forecast the need for Fixed Service Satellites (FSS) by countries within ITU Region 2 excluding the United States and Greenland. As a part of this study, forecasts of telecommunications equipment needs were developed as a yardstick of the relative level of telecommunications activity among developing countries within the region.

The study forecasts a likely scenario for the implementation of domestic and regional communications satellites to provide services to and among countries in ITU Region 2. By 1995, it is forecast that 15 fixed service satellites will be implemented as follows:

Canada (domestic)	5
Mexico (domestic)	2
Brazil (domestic)	2
Colombia/Venezuela (regional)	2
Argentina/Chile (regional)	2
South America and Caribbean (regional)	2

A forecast of these countries' requirements indicates that, with the possible exception of Canada, this constellation of satellites (with replacements as needed) will meet these countries' needs to beyond the year 2000.

INTRODUCTION

Over the last 15 to 20 years, the world and more specifically, Region 2*, has seen a continuous growth in satellite communications. This growth has

*As defined by the International Telecommunication Union (ITU).

been two-fold: (1) growth in usage by countries with established satellite systems and (2) growth in the number of countries implementing satellite systems. With this growth, there has been an increasing concern over the diminishing availability of orbital arc space and allocated spectrum. One of the concerns of all satellite users and potential users is "Will there be orbital arc and spectrum available for the new users and the new systems needed to satisfy future satellite communications requirements?". Although this is a global problem, it is of particular concern within Region 2. It is of paramount importance to be able to predict and determine the impact that new and proposed satellite systems will have upon the available orbital arc and allocated spectrum.

OBJECTIVES

The objectives of this study were to:

1. Assess the current worldwide telecommunications (Free World) activity and forecast the likely growth of that activity through 1990 (and beyond when feasible). This worldwide assessment was to be at the geographic region level (e.g., Asia, Africa, etc.) and the assessment for ITU Region 2 was to be at the country level. Activity was to be described in terms of equipment installations, plant investment, and, if possible, communications traffic.
2. Assess the potential for implementing communications satellites for domestic, regional (grouping of neighboring countries) and international telecommunication services within ITU Region 2.
3. Forecast the implementation of communications satellites in ITU Region 2 in the early to mid 1990's. The forecast was to provide a description of the likely satellite systems including information on launch dates, coverage areas, etc..

Although the United States' future implementation of domestic communications satellite systems is of prime importance in Region 2, it is not discussed in this report because of previous extensive studies. There are several available well-documented scenarios covering the United States (e.g., refs. 1 to 4).

APPROACH

The approach used in this study was to:

1. Review existing data on worldwide telecommunication activity, future requirements, and likely growth (refs. 5 to 16). Specific emphasis was placed on current reports concerning communications satellites and their implementation in Region 2;
2. Review on a country by country basis (Region 2) telecommunication requirements to include: (a) demographics; (b) economic status; (c) existing and planned terrestrial plant-in-place (including fiber optics and microwave systems); and (d) current and potential satellite usage;
3. Forecast the satellite addressable circuit demand in Region 2 for voice and video services for the years 1990 and 1995 (data services were assumed to be included in voice services); and
4. Determine the likely implementation of communications satellite systems by individual countries or by regional groups of countries.

OVERVIEW OF TELECOMMUNICATIONS ACTIVITY WORLDWIDE

For the purposes of this study, the world was divided into 6 major World Zones as shown in Figure 1. The estimated worldwide plant-in-place is shown in Table 1. It should be noted that data for the Soviet Union is not included. The data in Table 1 were derived from various sources as noted on the Table. Table 1 contains mixed year data, 1980 through 1984, and, as such, represents a primary data base. Details of the plant-in-place submarine cable are shown in Appendix A.

The telecommunications equipment categories included in Table 1 provide a good measure of current telecommunications activity worldwide. Each of these elements are briefly defined below.

1. Telephones - Total number of reported telephones in service.
2. Telex - Total number of telex stations identified with a dial number and/or derived by usage. Telex is a universal worldwide service. Note that in the United States and Canada there is, in addition to Telex, a similar system called Teletypewriter Exchange Service (TWX), which is similar to Telex, and it has been included in the count.
3. Intelsat Earth Stations - For convenience, a distinction is made between Intelsat earth stations that are used for domestic service only (strictly usage within a country) and international service only (strictly usage between countries). This distinction is as designated by Intelsat.
4. Submarine Cable - Cable which is laid under water for transmission within countries and between countries. There are three unique categories of submarine cable defined in this study. They are: (a) domestic - cable which originates and terminates in the same country; (b) intra-region - cable which originates and terminates within the same geographic region but not the same country; and (c) inter-region - cable which originates in one geographic region and terminates in another geographic region. The format of Table 1 does not permit a tabulation of inter-region submarine cable. However, this may be obtained from Appendix A.
5. Coax Cable - a conducting pair consisting of a wire inside an outer conducting tube. This cable is typically made to extremely high standards and well shielded (ref. 27).
6. Multipair - a set of conducting pairs each consisting of two parallel wire conductors (ref. 27). This type of cable comes in sizes of 25, 50, 100, etc., pairs.

7. Fiber Optic Cable - transmission medium consisting of cable containing a number of low-attenuation glass fibers through which may be transmitted digitally modulated light waves. Fiber optic cable is typically manufactured in 12, 24, 36, etc., fibers per cable.
8. Microwave Radio System - terrestrial line-of-sight radio communications at microwave frequencies between terminals usually located on towers or buildings.

It will be noted that a tabulation of domestic earth stations used with domestic satellites is not included in Table 1. Currently within Region 2, only Canada and Brazil (aside from the U.S.) operate domestic satellite systems and therefore domestic earth stations. Details may be found in Appendix B.

TELECOMMUNICATIONS ACTIVITY IN ITU REGION 2

Region 2 as defined by the International Telecommunication Union (ITU) includes North and South America, the Caribbean Basin, and Greenland (see Figure 2). For the purposes of this study, the United States and Greenland are not considered.

In order to develop a firm starting point for analyzing and forecasting the telecommunications activity within Region 2, data on telecommunications equipment were first developed for each of the years 1980 to 1984 (see Tables 2 to 6). Data are shown for five areas within Region 2. These data are further broken down by country in Appendix B. To provide some insight and perspective on the factors affecting telecommunications activity in each country, a data sheet including a brief narrative on each country is provided in Appendix C.

Based upon the announced plans of the countries within Region 2 and forecasts made in this study, the growth in telecommunications activity over the next decade in Region 2 (U.S. and Greenland excluded) is expected to be fairly brisk. In terms of announced terrestrial activity, the major activities appear to be in the following areas: (1) replacement and/or upgrading of existing switch capacity; (2) expansion of existing capacity with new switches; (3)

upgrading of existing cable plant; and (4) installation of new cable plant plus microwave and fiber optical cable. Forecasts reflecting such growth are shown in Tables 7(a), (b), and (c) for the years 1985, 1990 and 1995, respectively.

With the introduction of communications satellites into the developing countries of Region 2, the accessibility to many areas that are remote or inaccessible by current methods will be achieved. In addition to the increased accessibility, the overall telecommunications system reliability will improve.

In forecasting the likely need for satellites in the various countries within Region 2, forecasts were made only for voice circuits and video channels. The requirement for data circuits was judged to be negligible through 1995. Even in the U.S., with its highly developed economy, data services are forecast to account for only about 20 percent of the satellite-addressable traffic in the 1990 to 2000 time frame (ref. 1). It is assumed that whatever data services are required in other countries within Region 2 can be accommodated by the forecast voice circuits.

To determine the potential demand for satellite voice circuits, the analysis was broken into three steps. The first step was to forecast the total long-haul voice circuit requirements for each of the countries for the years 1990 and 1995. The next step was to estimate what percentage of that circuit requirement would likely be supplied (captured) by satellites in those same years. The final step was to convert the resulting satellite circuit requirement into equivalent 36 MHz transponders which is a commonly used measure of satellite capacity.

Rather than trying to make an independent forecast of each country's long-haul voice requirement, available forecasts were used wherever possible (refs. 5 to 9, 11, and 17 to 21). In order to assess the available forecasts and synthesize them into a single forecast, it was first necessary to convert them to a common unit of demand (i.e., voice half circuits). Since much of the baseline and forecast data were in terms of long-distance calls (N_{LD}) per year (e.g., refs. 5 to 8 and 20), the following formula was used to compute the equivalent voice half circuits (N_C) required to handle those calls:

$$N_C = 1.2 \times 10^{-4} \times N_{LD}$$

This conversion formula is based on standard calling statistics such as average peak-hour loading, average call length, acceptable blocking rates, etc. Although several simplifying assumptions were necessary in its derivation, the formula yields consistent results with the conversion methodologies used in refs. 3, 4, and 19.

Once the various voice data had been converted to numbers of voice half circuits, they were compared and cross-checked with other existing data with the intent of arriving at a best estimate. Although in some cases there were discrepancies among the different forecasts, it was possible to find sufficient agreement and supporting rationale through independent analyses to verify that the estimates made in this study were reasonable for each country in 1990 and 1995.

The next step was to estimate the percent of long-haul voice circuits likely to be captured by satellites. Several studies have examined the ability of satellites to supply or capture a portion of the long-haul voice traffic. In refs. 2 and 22, indices were determined to help estimate the potential of implementing a domestic satellite system, the formation of a regional type system or leasing of transponders from a satellite carrier for domestic service. Reference 22 used indices such as a "Telecommunication Traffic Dispersion Index (TDI)," "Volume of Telecommunication Traffic Index (TVI)," and a "Financial Position Index (FPI)" to compute a "Satellite Communications Procurement Index (SCPI)." Reference 9 derived an index by using an algorithm with parameters such as: (1) GNP; (2) population; (3) land area; (4) equivalent medium-size cities; (5) telecommunication market; (6) telephones; (7) radio receivers; and (8) television receivers. In reference 19, actual estimates of the percent of long-haul voice traffic that could be captured by satellites were offered.

Although the units or indices in each of the references are not directly comparable, the relative ranking of the countries as to their satellite potential was consistent. In general, when there were discrepancies, a logical

explanation could be found and a decision as to a logical choice between the indices could be made. After comparing the data, an estimate of the likely percentage of voice traffic capturable by satellite was made for each country.

The estimated capture percentage was then applied to the forecast voice circuit demand to compute the number of circuits likely to be captured by satellite.

The capturable satellite circuits were then converted to equivalent 36 MHz satellite transponders. With the technology likely to be used in these systems, it was assumed that one 36 MHz transponder could handle 1,200 voice half circuits. The results of these forecasts for 1990 and 1995 are shown in Tables 8 and 9, respectively.

To determine the satellite-delivered video service requirements for the individual countries, the information offered on such services by refs. 11, 14, 17, 18, and 23 to 26 were used. These references gave enough data to make what is believed to be reasonable estimates of the demand for video transponders. Table 10 presents these estimates for 1990 and 1995.

Using Tables 8, 9, and 10, the total number of satellite transponders forecast to be required in 1990 and 1995 is shown in Table 11.

IMPLEMENTATION OF SATELLITES IN ITU REGION 2

Although the forecast satellite demand shown in Table 11 represents what is believed to be a reasonable estimate of each country's satellite requirements, it must be used in combination with other factors to determine the most likely implementation scenario for these countries. One important factor is the announced plans of countries to launch satellite systems. These plans may be based on a perceived need different from that forecast in this study or on reasons which transcend simply implementing a system to meet a projected demand. The current status and plans for satellites for Canada, Mexico, Brazil, Argentina, and Colombia are described in Appendix D. A summary of these countries' plans for domestic satellite systems is as follows:

1. Canada - 5 satellite system
2. Mexico - 2 satellite system
3. Brazil - 2 satellite system
4. Argentina - 2 satellite system
5. Colombia - 2 satellite system

In addition to the individual country plans listed above, PanAm Sat has proposed a regional satellite system with one satellite serving South America and the Caribbean (ref. 22). Also, Cuba has filed for a one-satellite system but has requested an orbital slot already occupied by RCA's Satcom 4 (83.0°W).

By combining the announced plans of the various countries to launch satellite systems with their needs forecast in this study, a likely scenario for the implementation of communications satellites in Region 2 (excluding the United States) was forecast and is described below:

Canada - Will fill its current reserved orbital slots with satellites and maintain its current replacement policy. Even though Canada is today experiencing a serious excess satellite capacity, expected demand growth in the next 10 to 15 years will result in capacity requirements approaching that of five standard satellites (twenty-four 36 MHz transponders per satellite).

Mexico - Will have 2 satellites in orbit by 1986 and will maintain them through at least the 1995 to 1997 time frame. When this system begins to fail, Mexico will likely replace it with a similar system. At the growth rates forecast in this study, a 2-satellite system will be more than adequate to handle all of their needs well into the early 2000's. Mexico's first satellite was scheduled for launch in June 1985.

Brazil - Will have 2 satellites in orbit by 1986 and will maintain them through at least the 1995 to 1997 time frame. As this system begins to fail, Brazil will likely replace it with a similar system. At the growth rates forecast in this study, a 2-satellite system will be more than adequate to handle all of their needs into the early 2000's. Brazil's first satellite was launched in February 1985 and is presently on station and operational.

The forecast satellite requirements of the remaining Region 2 countries do not appear to justify a dedicated domestic satellite system such as those discussed above. However, neighboring countries which could pool their individual satellite needs could utilize a satellite system much like the various Arab countries use Arabsat. Two regional satellite systems which appear to be logical, from the standpoint that the countries have a common border and significant inter-country traffic, are forecast below.

Colombia/Venezuela - Will form a regional consortium in the 1986-1988 time frame and launch a 2-satellite system in the early 1990's. This system would handle each country's domestic long-haul telephony and video traffic as well as the inter-country satellite traffic.

Argentina/Chile - Will form a regional consortium in the 1986-1988 time frame and launch a 2-satellite system in the early 1990's. This system would handle each country's domestic long-haul telephony and video traffic as well as the inter-country satellite traffic.

TABLE I - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT WORLDWIDE* PRIMARY DATA BASE - MIXED YEAR DATA - NO PROJECTIONS

World Zone	Terminal Equipment (Numbers)				Long-Haul Transmission Media (Ch-Km)					
	Telephones ^a	Telex ^b	Intelsat E/SC		Submarine ^{d,e}		Coax ^f	Multipair ^f	Fiber Optic ^f	Microwave ^f
			Dom	Int'l	Domestic	Intra-Region				
North America**	197,634,723	234,652 ^g	NR	24	2,835,229	NR	488,200,000	113,175,000	10,775,000	1,036,025,000
Latin America	24,258,624	68,800	389	48	8,168,677	557,646	3,855,556	4,388,889	NR	81,544,445
Europe	172,098,479	475,926	69	82	13,376,247	194,771,183	1,623,878,378	40,148,649	1,324,325	545,432,433
Asia	81,115,601	166,020	104	93	NR	NR	2,308,657	72,815	NR	375,417
Africa	6,135,956	43,610	112	87	564,566	2,672,807	NR	3,031,381	NR	118,085,119
Oceania	13,379,615	38,535	79	25	5,487,420	11,492,297	552,239	NR	NR	7,805,970
Totals	494,027,530	1,027,543	753	359	31,432,139	209,493,933	2,118,794,830	160,816,734	12,099,325	1,781,463,265

Notes

NR = No Record

*USSR not included

**Includes United States data

^aAmerican Telephone & Telegraph Co - long lines 1982 data (includes U S)^b1980 data Sources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited^c1984 data Source Intelsat^d1980 data Sources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc^eSee Appendix A for Interregional data^f1980 data^g1980 data - Canada-Canadian Astronautics Limited Report entitled "Final Report - A Study of Canadian EHF Communication Requirements and Technology Development" dated September 1983, pp 4-38 and 4-43 Data in report as of 1983 - have adjusted downward to 1980 at 3 percent average annual growth rate - includes telex and TWX terminals USA - Western Union Telegraph Co report entitled "Satellite Provided Fixed Communications Services A Forecast of Potential Domestic Demand Through the Year 2000," Final Report - Volume II dated August 1983, pp 3-21 Data includes telex and TWX terminals

TABLE II - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1980

Terminal Equipment (Numbers)					Long-Haul Transmission Media (Ch-Km)					
Area	Telephones ^a	Telex ^b	Intelsat E/SC		Submarine ^d		Coax	Multipair	Fiber Optic	Microwave
			Dom	Int'l	Domestic	Intra-Area				
Canada	15,560,264	104,045	NR	4	1,076,923	NR	78,420,000	22,875,000	1,166,355	384,250,000
Mexico	4,532,557	8,700	NR	1	132,653	NR	NR	434,000	NR	14,255,102
Central America	607,021	7,379	NR	4	NR	NR	NR	NR	NR	NR
Caribbean Basin	1,308,346	5,377	NR	7	NR	NR	NR	NR	NR	NR
South America	13,359,626	62,031	14	19	8,036,024	557,646	3,149,969	10,181,150	NR	40,951,267
Totals	35,367,814	187,532	14	35	9,245,600	557,646	81,569,969	33,490,150	1,166,355	439,456,369

Note

Canada had 137 domestic, non-Intelsat type earth stations working with the Canadian Anik series birds

*Excludes United States and Greenland

NR = No Record

^aAmerican Telephone & Telegraph Co - long lines 1980 data

^bSources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^cSource Intelsat

^dSources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

TABLE III - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1981

Area	Terminal Equipment (Numbers)				Long-Haul Transmission Media (Ch-Km)					
	Telephones ^a	Telex ^b	Intelsat E/S ^c		Submarine ^d		Coax	Multipair	Fiber Optic	Microwave
			Dom	Int'l	Domestic	Intra-Area				
Canada	16,178,158	107,263	NR	5	1,174,923	NR	74,499,000	23,058,000	1,790,354	391,935,000
Mexico	5,082,718	9,170	4	3	145,653	NR	NR	454,783	NR	15,652,102
Central America	676,931	8,247	NR	7	NR	NR	NR	NR	NR	NR
Caribbean Basin	1,328,438	5,612	NR	8	NR	NR	NR	NR	NR	NR
South America	15,150,815	73,048	25	21	6,642,024	557,646	3,112,696	10,370,150	NR	46,752,267
Totals	38,417,120	203,340	29	44	7,962,600	557,646	77,611,696	33,882,933	1,790,354	454,339,369

Note

Canada had 211 domestic, non-Intelsat system earth stations working with the Canadian Anik series birds

*Excludes United States and Greenland

NR = No Record

^aAmerican Telephone & Telegraph Co - long lines 1981 data

^bSources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^cSource Intelsat

^dSources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

TABLE IV - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1982

Terminal Equipment (Numbers)					Long-Haul Transmission Media (Ch-Km)					
Area	Telephones ^a	Telex ^b	Intelsat E/S ^c		Submarine ^d		Coax	Multipair	Fiber Optic	Microwave
			Dom	Int'l	Domestic	Intra-Area				
Canada	16,741,723	110,580	NR	5	1,281,841	NR	70,774,050	23,242,464	2,748,194	399,773,700
Mexico	5,411,108	9,665	119	3	159,927	NR	NR	475,703	NR	17,186,008
Central America	746,425	8,498	NR	8	NR	NR	NR	NR	NR	NR
Caribbean Basin	1,410,741	5,859	NR	8	NR	NR	NR	NR	NR	NR
South America	16,294,327	86,785	82	21	5,604,956	557,646	3,115,444	10,574,086	NR	53,397,678
Totals	40,604,324	221,387	201	45	7,046,724	557,646	73,889,494	34,292,253	2,748,194	470,357,386

Note

Canada had 317 domestic, non-Intelsat type earth stations working with the Canadian Anik series birds

*Excludes United States and Greenland

NR = No Record

^aAmerican Telephone & Telegraph Co - long lines 1982 data

^bSources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^cSource Intelsat

^dSources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

TABLE V - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1983

Terminal Equipment (Numbers)					Long-Haul Transmission Media (Ch-Km)					
Area	Telephones ^a	Telex ^b	Intelsat E/SC ^c		Submarine ^d		Coax	Multipair	Fiber Optic	Microwave
			Dom	Int'l	Domestic	Intra-Area				
Canada	17,079,769	114,000	NR	6	1,398,489	NR	67,235,348	23,707,313	4,218,479	407,769,174
Mexico	5,963,041	10,187	120	3	175,600	NR	NR	497,585	NR	18,870,237
Central America	827,660	8,754	NR	8	NR	NR	NR	NR	NR	NR
Caribbean Basin	1,472,222	6,107	NR	8	NR	NR	NR	NR	NR	NR
South America	18,045,676	103,536	119	23	4,824,009	557,646	3,159,282	10,793,218	NR	61,013,913
Totals	43,388,368	242,584	239	48	6,398,098	557,646	70,394,630	34,998,116	4,218,479	487,653,324

Note

Canada had 476 domestic, non-Intelsat type earth stations working with the Canadian Anik series birds

*Excludes United States and Greenland

NR = No Record

^aAmerican Telephone & Telegraph Co - long lines 1982 data

^bSources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^cSource Intelsat

^dSources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

TABLE VI - SUMMARY OF TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1984

Terminal Equipment (Numbers)					Long-Haul Transmission Media (Ch-Km)					
Area	Telephones ^a	Telex ^b	Intelsat E/S ^c		Submarine ^d		Coax	Multipair	Fiber Optic	Microwave
			Dom	Int'l	Domestic	Intra-Area				
Canada	18,531,549	117,420	NR	7	1,525,756	NR	63,873,581	24,181,459	6,475,365	415,924,551
Mexico	6,571,271	10,737	162	3	192,809	NR	NR	520,474	NR	20,719,520
Central America	918,084	9,508	NR	8	NR	NR	NR	NR	NR	NR
Caribbean Basin	1,536,452	6,369	NR	8	NR	NR	NR	NR	NR	NR
South America	19,838,509	124,086	227	26	4,227,388	557,646	3,246,135	11,027,842	NR	69,746,880
Totals	47,395,865	268,120	389	52	5,945,949	557,646	67,119,716	35,729,775	6,475,365	506,390,957

Note

Canada had 710 domestic, non-Intelsat type earth stations working with the Canadian Anik series birds

*Excludes United States and Greenland

NR = No Record

^aAmerican Telephone & Telegraph Co - long lines 1982 data

^bSources include Arthur D Little, Western Union Telegraph Co and Canadian Astronautics Limited

^cSource Intelsat

^dSources include 1980 World's Submarine Telephone Cable Systems - NTIA and Arthur D Little Inc

TABLE VII(a) - FORECASTED TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1985

Terminal Equipment (Numbers)					Long-Haul Transmission Media (Ch-Km)				
Area	Telephones	Telex	Intelsat E/S		Submarine	Coax	Multipair	Fiber Optic	Microwave
			Dom	Int'l	Domestic				
Canada	20,106,730	120,943	NR	7	1,664,595	60,679,902	24,374,911	9,939,686	424,243,049
Mexico	7,241,541	11,317	162	3	211,704	NR	544,416	NR	22,750,033
Central America	1,018,780	10,341	NR	8	NR	NR	NR	NR	NR
Caribbean Basin	1,603,618	6,642	NR	10	NR	NR	NR	NR	NR
South America	21,749,710	149,368	227	26	3,763,933	3,378,560	11,278,290	0	79,765,089
Totals	51,720,379	298,611	389	54	5,640,232	64,058,462	36,197,617	9,939,686	526,758,171

*Excludes United States and Greenland

Notes

- 1 Canada will have 1,065 Domestic, non-Intelsat, type earth stations working with the Canadian Anik series birds
- 2 Mexico is expected to remove all of its domestic Intelsat earth stations and replace them with their own earth stations between 1985 and 1990. Estimated number of earth stations is 2000
- 3 Brazil can be expected to install its own domestic earth station beginning in 1985 for use with their own domestic satellite system

TABLE VII(b) - FORECASTED TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1990

Terminal Equipment (Numbers)					Long-Haul Transmission Media (Ch-Km)				
Area	Telephones	Telex	Intelsat E/S		Submarine	Coax	Multipair	Fiber Optic	Microwave
			Dom	Int'l	Domestic				
Canada	32,170,768	193,509	NR	9	2,663,352	67,084,843	28,999,858	15,903,498	478,788,873
Mexico	11,586,466	18,107	NR	4	338,726	NR	871,066	2,560	36,400,053
Central America	1,616,255	16,250	23	8	NR	NR	NR	NR	NR
Caribbean Basin	2,581,810	10,627	NR	13	NR	NR	NR	NR	NR
South America	34,799,379	238,988	240	38	3,109,441	5,405,696	18,045,263	45,000	127,624,143
Totals	82,754,678	477,481	263	72	6,111,519	72,490,539	47,916,187	15,951,058	642,813,069

*Excludes United States and Greenland

TABLE VII(c) - FORECASTED TELECOMMUNICATIONS EQUIPMENT REGION 2* - 1995

Terminal Equipment (Numbers)					Long-Haul Transmission Media (Ch-Km)				
Area	Telephones	Telex	Intelsat E/S		Submarine	Coax	Multipair	Fiber Optic	Microwave
			Dom	Int'l	Domestic				
Canada	51,473,229	309,614	NR	11	4,261,363	73,340,549	32,399,773	25,445,597	538,062,204
Mexico	18,538,346	28,971	NR	5	541,962	NR	1,393,706	4,096	58,240,085
Central America	2,586,012	26,002	23	8	NR	NR	NR	NR	NR
Caribbean Basin	4,130,898	17,005	NR	13	NR	NR	NR	NR	NR
South America	55,678,709	382,378	383	40	4,882,946	8,649,113	28,872,422	72,000	204,198,630
Totals	132,407,194	763,970	406	77	9,686,271	81,989,662	62,665,901	25,521,693	800,500,919

*Excludes United States and Greenland

TABLE VIII - VOICE/TRANSPONDER FORECAST 1990

Country	Voice Half Circuits	Satellite Capture, %	Satellite Capture (Circuits)	Equiv 36 MHz Transponders
Canada	118,000	30	36,000	30
Brazil	78,000	20	16,000	13
Mexico	44,000	13	6,000	5
Colombia	14,000	12	1,700	1.4
Chile	6,000	14	800	0.7
Argentina	12,000	11	1,300	1
Venezuela	10,000	11	1,100	1
Bolivia	1,500	10	150	0.1
Ecuador	1,500	10	150	0.1
Peru	1,700	9	150	0.1

TABLE IX - VOICE/TRANSPONDER FORECAST 1995

Country	Voice Half Circuits	Satellite Capture, %	Satellite Capture (Circuits)	Equiv 36 MHz Transponders
Canada	151,000	33	50,000	42
Brazil	100,000	25	25,000	21
Mexico	56,000	22	12,000	10
Colombia	18,000	17	3,000	2.5
Chile	8,000	18	1,500	1.3
Argentina	15,000	19	2,800	2.3
Venezuela	12,000	19	2,300	2
Bolivia	1,900	15	300	0.3
Ecuador	1,900	15	300	0.3
Peru	2,200	13	300	0.3

TABLE X - VIDEO TRANSPONDER FORECAST

Country	1990	1995
Canada	63	71
Brazil	8	9
Mexico	4	5
Colombia	2	3
Chile	1	1
Argentina	2	2
Venezuela	2	3
Bolivia	1	1
Equador	1	1
Peru	2	3

TABLE XI - TOTAL TRANSPONDER FORECAST

Country	1990	1995
Canada	93	113
Brazil	21	30
Mexico	9	15
Colombia	3 4	5 5
Chile	1 7	2 3
Argentina	3	4 3
Venezuela	3	5
Bolivia	1 1	1 3
Equador	1 1	1 3
Peru	2 1	3 3

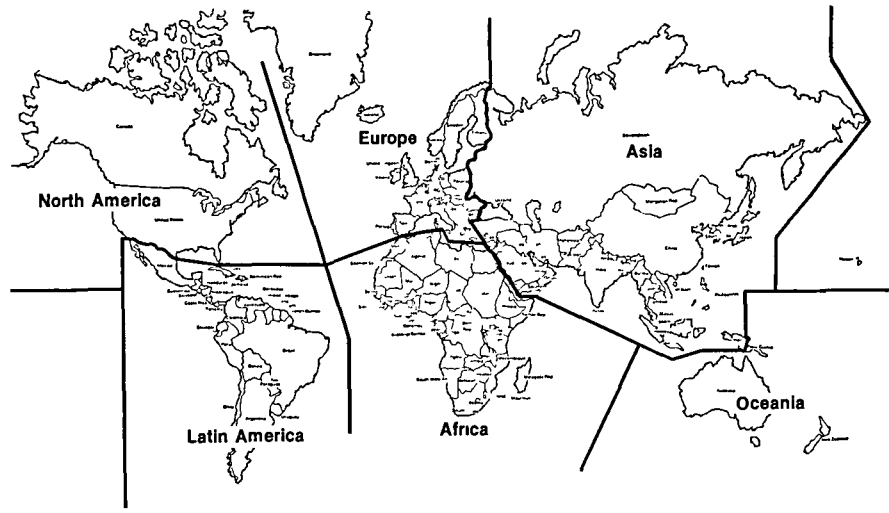


Figure 1 - World Zones

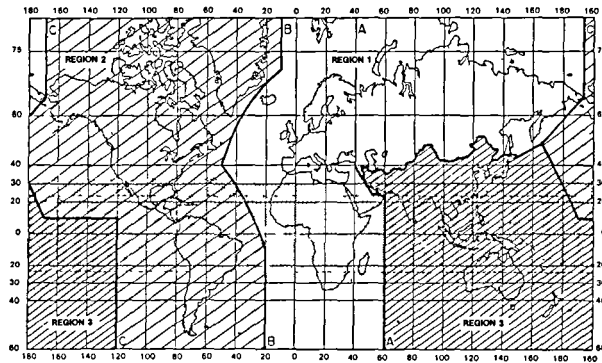


Figure 2. - International Telecommunication Union (ITU) World Region Definition.

APPENDIX A
WORLD SUBMARINE CABLES

<u>Submarine Cables</u>	<u>Miles Cables</u>	<u>Ch/Km</u>	<u>Number VF's</u>	<u>Service Points</u>	
1 USA - Cuba	119	4,595	24	USA/Cuba	Inter-region
2 USA - Cuba	129	4,981	24	USA/Cuba	Inter-region
3 Marseille - Bordj el Kiffan	477	61,399	80	France/Algeria	Inter-region
4 Cape Dyer - Thule - White Bay	2740	317,424	72	Canada/Greenland-Military	Inter-region
5 Transatlantic No 2	2,209	170,605	48	Canada/France	Inter-region
6 Florida - Puerto Rico	1,136	91,391	50	USA/Puerto Rico	Inter-region
7 Canada Transatlantic 1	2,073	266,837	80	Canada/England	Inter-region
8 Iceland - Greenland - Canada	1,777	68,621	24	Canada/Iceland	Inter-region
9 Canet Plage - Mers el Kebir	542	69,766	80	France/Algeria	Inter-region
10 New Jersey - Bermuda	750	98,954	82	Bermuda/USA	Inter-region
11 Commonwealth Pacific Cable	8,233	1,086,246	82	Canada/Australia	Inter-region
12 Florida - Jamaica - Canal Zone	1,455	337,118 /	144	USA/Jamaica/Panama	Inter-region
		299,660	128		Inter-region
13 Transatlantic No 3	3,518	781,144	138	USA/England	Inter-region
14 Transpacific No 1	5,282	1,206,821 /	142	USA (Hawaii - Japan)	Inter-region
		1,172,826	138		Inter-region
15 Florida - St Thomas No 1	1,179	269,376	142	USA (Florida/Virgin Isle)	Inter-region
16 Transatlantic No 4	3,599	799,129	138	USA/France	Inter-region
17 Cape Canaveral - Grand Turk	763	331,470 /	270	USA/Bahamas/Grand Turk	Inter-region
		73,660	60		Inter-region
18 Canet Plage - Tetorian	758	117,084	96	France/Morocco	Inter-region
19 Florida - St Thomas No 2	1,298	1,503,707	720	USA (Florida - Virgin Isle)	Inter-region
20 Marseille - Tel Aviv	1,833	377,510	128	France/Israel	Inter-region

APPENDIX A (cont)

21	Agrigento - Tripoli	298	57,538	120	Italy/Libya	Inter-region
22	Japan Sea Cable	477	92,099	120	Japan/USSR	Inter-region
23	South Atlantic No 1	5,878	3,404,773	360	Portugal/Canary Isle/Cape Verde Isle/Ascension Isle	Inter-region
					South Africa	Inter-region
24	Marseille - Bizerte	462	71,362	96	France/Tunisia	Inter-region
25	Marseille - Beirut	1,837	472,917	160	France/Lebanon	Inter-region
26	Transatlantic No 5	3,461	4,705,593	845	USA/Spain	Inter-region
27	Mill Village - Bermuda	825	637,164	480	Canada/Bermuda	Inter-region
28	Pisa - Algiers	580	447,946	480	Italy/Algeria	Inter-region
29	Marseilles - Bordj El Kiffan	444	342,910	480	France/Algeria	Inter-region
30	Florida - Bahamas	222	492,933	1,380	Bahamas/USA	Inter-region
31	Catanzaro - Alexandria	890	687,365	480	Italy/Egypt	Inter-region
32	Brazil - Canary Isls No 1	2,649	681,959	160	Canary Isle/Brazil	Inter-region
33	Penmarch - Casablanca	1,035	1,065,802	640	France/Morocco	Inter-region
34	Wedemouthe - Halifax	2,805	8,304,371	1,840	England/Canada	Inter-region
35	France-Greece-Cyprus-Lebanon	1,981	1,529,966	480	France/Greece Cyprus/Lebanon	Inter-region
36	Transpac 2	4,880	6,634,872	845	USA (Hawaii/Guam)	Inter-region
37	Telpal	1,470	3,264,017	1,380	Israel/Italy	Inter-region
38	Annibal	509	524,148	640	France/Tunisia	Inter-region
39	Algeria - Spain	182	140,462	480	Spain/Algeria	Inter-region
40	Transatlantic 6	3,396	21,856,656	4,000	USA/France	Inter-region
41	Australia-Papua New Guinea Cable	485	374,575	480	Australia/Papua	Inter-region
42	Spain - Venezuela	3,239	9,589,254	1,840	Spain/Venezuela	Inter-region
43	Amitie	825	<u>3,106,175</u>	<u>2,340</u>	France/Morocco	Inter-region
Subtotals			77,995,251	23,016		

APPENDIX A (cont)

44	Alexandria - Beirut	375	72,405	120	Egypt/Lebanon	Intra - Africa
45	Antinea	1,464	1,507,569	640	Morocco/Senegal	Intra - Africa
46	Fraternite	1,415	<u>1,092,833</u>	<u>480</u>	Senegal/Ivory Coast	Intra - Africa
	Subtotals		2,672,807	1,240		
47	Oostmahorn - Romo	142	27,417	120	Netherlands/Denmark	Intra - Europe
48	Oostmahorn - Romo	142	27,417	120	Netherlands/Denmark	Intra - Europe
49	Weybourne - Fans	307	3,952	8	England/Denmark	Intra - Europe
50	Holyhead - Dublin A	62	5,985	60	Wales/Irish Rep	Intra - Europe
51	Holyhead - Dublin B	63	6,082	60	Wales/Irish Rep	Intra - Europe
52	Strabathie - O's	307	17,783	36	Scotland/Norway	Intra - Europe
53	Sicily - Malta	53	4,093	48	Malta/Italy	Intra - Europe
54	Kristiansand - Thisled	69	6,661	60	Norway/Denmark	Intra - Europe
55	Westterschelling - Maade	182	17,570	60	Netherlands/Denmark	Intra - Europe
56	Aldeburgh - Domburg No 6	82	23,749	180	England/Netherlands	Intra - Europe
57	Weybourne - Fano	307	3,952	8	England/Denmark	Intra - Europe
58	Dumpton Gap - Middelkerke	76	14,674	120	England/Belgium	Intra - Europe
59	Goteborg - Middlesbrough	528	50,973	60	Sweden/England	Intra - Europe
60	Denmark - Poland	105	30,410	180	Denmark/Poland	Intra - Europe
61	Scotland - Faeroes - Iceland	685	28,656	26	England/Denmark/Iceland	Intra - Europe
			33,065	30		Intra - Europe
62	Colwyn Bay - Lancaster	73	14,095	120	England/Wales	Intra - Europe
63	Winterton - Borkum 1	251	48,463	120	England/Germany	Intra - Europe
64	Winterton - Borkum 2	249	48,077	120	England/Germany	Intra - Europe
65	St Margarets Bay - Xa Panne	48	32,437	420	England/Belgium	Intra - Europe
66	Winterton - Maade	298	57,538	120	England/Denmark	Intra - Europe

APPENDIX A (cont)

67	Covehitte - Katwijk No 1	109	21,046	120	England/Netherlands	Intra - Europe
68	Peninsula - Canary Isle No 1	754	194,110	160	Spain (Spain-Canary Isle)	Intra - Europe
69	Kristiansand - Thisted 2	80	61,786	480	Norway/Denmark	Intra - Europe
70	Garrlock - Stornoway	48	4,634	60	Scotland/England	Intra - Europe
71	Covehitte - Katwijk No 2	109	84,183	480	Netherlands/England	Intra - Europe
72	Kristiansand - Scarborough	393	303,522	480	Norway/England	Intra - Europe
73	Germany - Sweden 1	121	93,451	480	Germany/Sweden	Intra - Europe
74	Barcelona - Pisa	430	332,098	480	Spain/Italy	Intra - Europe
75	Goonhilly - Scsibra	951	979,302	640	England/Portugal	Intra - Europe
76	Mediterranean - Atlantic 1	986	1,015,343	640	Spain/Italy	Intra - Europe
77	U K - Spain 1	477	368,397	480	England/Spain	Intra - Europe
78	Winterton - Fedderwarden	285	577,792	1,260	England/Germany	Intra - Europe
79	Aldeburgh - Donburg 7	83	168,269	1,260	England/Netherlands	Intra - Europe
80	Broadstairs - Oostende	64	129,750	1,260	England/Belgium	Intra - Europe
81	St Peter Port-Tuchton Bridge A	89	197,617	1,380	England/Buernsey Isle	Intra - Europe
82	Lerwich - Torshavn	235	181,495	480	England/Denmark	Intra - Europe
83	Scarborough - Thisted	381	772,417	1,260	England/Denmark	Intra - Europe
84	Barcelona - Rome	513	1,139,076	1,380	Italy/Spain	Intra - Europe
85	Germany - Sweeden 2	113	218,180	1,200	Germany/Sweden	Intra - Europe
86	U K - Spain No 2	465	1,032,495	1,380	England/Spain	Intra - Europe
87	U K - Netherlands 9	82	182,074	1,380	England/Netherlands	Intra - Europe
88	Marpal	370	1,535,951	2,580	France/Italy	Intra - Europe
89	France - U K 1	104	575,636	3,440	France/England	Intra - Europe
90	Italy - Turkey	1,083	836,423	480	Italy/Turkey	Intra - Europe
91	St Margaret's Bay-St Idesbald	56	351,406	3,900	England/Belgium	Intra - Europe
92	Denmark - Norway 4	77	334,511	2,700	Norway/Denmark	Intra - Europe
93	Germany - Sweden 3	109	210,457	1,200	Germany/Sweden	Intra - Europe

APPENDIX A (cont)

94	Holywell Retreat - St Valery	60	405,468	4,200	England/France	Intra - Europe
95	Barcelona - Genoa	389	2,591,230	4,140	Italy/Spain	Intra - Europe
96	Portugal - France	802	3,329,278	2,580	Portugal/France	Intra - Europe
97	Lovesloft - Egmond	119	<u>746,737</u>	<u>3,900</u>	England/Netherlands	Intra - Europe
	Subtotals		194,771,183	47,936		
98	Tortola - Bermuda	902	116,105	80	Tortola B V I /Bermuda	Intra - LAmer
				B C C		Intra - LAmer
99	St Thomas - Venezuela	545	72,783	83	Venezuela-U S Virgin Isle	Intra - LAmer
100	St Thomas - Dominican Republic	386	89,435	144	USA (Virgin Isle -	Intra - LAmer
				Dominican Rep)		Intra - LAmer
101	Kingston - Grand Cayman	388	99,887	160	Jamaica/Cayman Isles	Intra - LAmer
102	St Thomas-St Maarten-Curacao	697	179,436	160	USA (Virgin Isle/	Intra - LAmer
			<u> </u>	<u> </u>	Netherlands Antilles)	Intra - LAmer
	Subtotals		557,646	627		
103	Grand Turk - Antigua	713	68,833	60	USA - Military	Intra - Oceania
104	Southeast Asia Communications	4,080	538,307	82	Singapore/Malaysia/Hong	Intra - Oceania
				Kong/Guam		Intra - Oceania
105	Hawaii - Johnson Isle	769	74,239	60	USA (Hawaii-Johnson Isle)	Intra - Oceania
				Military		Intra - Oceania
106	Southwest Asia Comm Cable	3,005	802,617	166	Australia/Papua/Guam	Intra - Oceania
107	Taiwan - Okinawa	363	35,044	60	Taiwan/Okinawa	Intra - Oceania
108	East China Sea Cable	480	370,714	480	Japan/China	Intra - Oceania
109	Tasman Sea Cable	1,190	919,061	480	Australia/New Zealand	Intra - Oceania

APPENDIX A (cont)

110	Okinawa - Luzon - Hong Kong	1,203	2,322,752	1,200	Japan/Luzon/	Intra - Oceania
			2,671,165	1,380	Hong Kong	Intra - Oceania
111	Philippines - Singapore	1,534	3,406,124	1,380	Philippines/Singapore	Intra - Oceania
112	Japan - Republic of China	367	<u>283,441</u>	<u>480</u>	Japan/Taiwan	Intra - Oceania
	Subtotals		11,492,297	5,828		
113	Kelibia - Bon Fichta	59	11,392	120	Tunisia	Domestic - Africa
114	Tripoli - Benghazi	382	<u>553,174</u>	<u>900</u> + 2TV	Libya	Domestic - Africa
	Subtotals		564,566	1,020 + 2TV		
115	Italy - Tunisia	60	5,792	60	Italy - Military	Domestic - Europe
116	Italy - Sardinia 1	130	12,550	60	Italy	Domestic - Europe
117	St Helier - Tuckton Bridge A	131	25,293	120	Jersey Isle/England	Domestic - Europe
118	Colwyn - Douglas	61	11,778	120	Wales/Isle of Man	Domestic - Europe
119	Trapani - Cagliari	218	42,091	120	Italy	Domestic - Europe
120	Cannes - Isle Rousse	106	16,373	96	France (Cannes-Isle Rousse)	Domestic - Europe
121	St Helier - Tuckton Bridge B	137	105,808	480	England/Jersey	Domestic - Europe
122	Nejkobing - Rome	103	79,549	480	Denmark	Domestic - Europe
123	Cotanzaro - Leklaina	286	220,884	480	Italy	Domestic - Europe
124	Italy - Sardinia 2	135	104,263	480	Italy	Domestic - Europe
125	St Raphael - St Tropez	15	11,585	480	France	Domestic - Europe
126	Sljernesksansen - Haleskor	10 2	265,871	16,200	Denmark	Domestic - Europe
127	Copenhagen - Aarlus	17 4	17,918	16,200	Denmark	Domestic - Europe
128	Trans - Canary Cable	217	167,593	480	Canary Isle	Domestic - Europe
129	Peninsula - Balearic Isle 1	183	406,337	1,380	Spain	Domestic - Europe

APPENDIX A (cont)

130	Peninsula - Canary Isle 2	737	2,181,933	1,840	Spain	Domestic - Europe
131	Las Palmas - Tenerife	60	177,634	1,840	Spain	Domestic - Europe
132	Lisboa - Funchal	616	118,937	120	Portugal	Domestic - Europe
133	Orkney - Shetlands	108	83,411	480	England	Domestic - Europe
134	Civitavecchia - Cagliari	301	668,346	1,380	Italy	Domestic - Europe
135	St Raphael - La Foux	19	71,536	2,340	France	Domestic - Europe
136	Aegus	184	408,557	1,380	Greece	Domestic - Europe
137	Fridtorp - Hornsude	50	9,654	120	Sweden	Domestic - Europe
138	Rome - Palermo	257	726,946	1,800 + 2TV	Italy	Domestic - Europe
139	Marseille - Bastia	181	681,476	2,340	France	Domestic - Europe
140	Peninsula - Balearic Isle No 2	162	1,016,566	3,900	Spain	Domestic - Europe
141	Grossenbrode - Burg By-Pass	7	13,516	1,200	Germany	Domestic - Europe
142	Peninsula - Canary Isle No 3	743	4,160,295	3,480	Spain	Domestic - Europe
143	Genoa - Sassari	272	<u>1,575,533</u>	<u>3,600</u>	Italy	Domestic - Europe
Subtotals			13,376,247	63,056 + 2TV		
144	Hawaii - California	2210	181,350	51	USA	Domestic - NAmer
145	Hawaii No 2	2,383	544,463	142	USA (California-Makaha)	Domestic - NAmer
146	Oahu Submarine Tic	49	7,569	96	USA (Hawaii)	Domestic - NAmer
147	Hawaii No 3	2,379	<u>3,234,500</u>	<u>845</u>	USA (Hawaii - California)	Domestic - NAmer
Subtotals			3,967,882	1,134		
148	Guam - Philippines	1,468	302,338	128	Guam/Philippines	Domestic - Oceania
149	Mori-Muroran 1	19	27,514	900	Japan	Domestic - Oceania
150	Kure - Matsuyama 1 & 2	34	295,412	5,400	Japan	Domestic - Oceania

APPENDIX A (cont)

151	Sagami Bay Loop 1	13	56,476	2,700	Japan	Domestic - Oceania
152	Okinawa - Zamami - Kumejima	64	92,678	900	Japan	Domestic - Oceania
153	Sagami Bay 2	65	125,502	1,200	Japan	Domestic - Oceania
154	Aomori - Hahodate	30	130,329	2,700	Japan	Domestic - Oceania
155	Miura - Ibaraki	244	1,060,009	2,700	Japan	Domestic - Oceania
156	Miura - Itok	34	65,647	1,200	Japan	Domestic - Oceania
157	Mori - Muroran 2	19	82,542	2,700	Japan	Domestic - Oceania
158	Okinawa - Mayako	194	280,931	900 + 2TV	Japan	Domestic - Oceania
159	Okinawa - Miyazaki	483	2,098,297	2,700	Japan	Domestic - Oceania
160	Kynshu - IRI - Tsushima	72	312,790	2,700	Japan	Domestic - Oceania
161	Tsushima By-Pass	22	31,858	900	Japan	Domestic - Oceania
162	Sagami Bay 3	53	102,332	1,200	Japan	Domestic - Oceania
163	Itok - Miyahe	62	269,347	2,700	Japan	Domestic - Oceania
164	Miyahe - Hachijo	79	114,400	900	Japan	Domestic - Oceania
165	Sagami Bay No 4	81	<u>39,018</u>	<u>10,800</u>	Japan	Domestic - Oceania
Subtotals			5,487,420	43,328 + 2TV		

166	Argentina - Argentina	127	96,000	480	Argentina	Domestic - SAmer
167	Brazil - Brazil	966	4,155,710	5,400	Brazil	Domestic - SAmer
168	Venezuela - Venezuela	2,379	<u>3,784,314</u>	<u>3,400</u>	Venezuela	Domestic - SAmer
Subtotals			8,036,024	9,600		

APPENDIX B
TELECOMMUNICATIONS EQUIPMENT BY COUNTRY IN ITU REGION 2 1980-85
CANADA TELECOMMUNICATIONS
[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	15,560,264	16,178,158	16,741,723	17,079,769	18,531,549	20,106,730
Telex	104,045	107,263	110,580	114,000	117,420	120,943
<u>Media</u>						
Microwave Ch-Km	384,250,000	391,935,000	399,773,700	407,769,174	415,924,557	424,243,049
Coaxial Cable Ch-Km	78,420,000	74,499,000	70,774,050	67,235,348	63,873,581	60,679,902
Multipair Cable Ch-Km	22,875,000	23,058,000	23,242,464	23,707,313	24,181,459	24,374,911
Fiber Optical Cable Ch-Km	1,166,355	1,790,354	2,748,194	4,218,479	6,475,365	9,939,686
<u>Satellite</u>						
Intelsat E/S	a4	b4+1	5	c5+1	d5+2-1	7
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	137	e211	317	476	710	1,065
<u>Submarine Cable</u>						
Domestic Ch-Km	1,076,923	1,174,923	1,281,841	1,398,489	1,525,752	1,664,595

^aIntelsat earth station installed 1966, 1969, 1972 and 1979 - A models

^bIntelsat earth station installed January 1981 - A model

^cIntelsat earth station installed December 1983 - E model

^dIntelsat earth station installed May and June 1984 - A model The 1966 installed earth station is retired in July 1984

^eYankee Group Telecommunications Analysis and Research, Vol 3, 1984 Canadian Communication, p 15, Figures 1-5 - adjusted to reflect beginning of year status

MEXICO TELECOMMUNICATIONS

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	4,532,557	5,082,718	5,411,108	5,963,041	6,571,271	7,241,541
Telex	8,700	9,170	9,665	10,187	10,737	11,317
<u>Media</u>						
Microwave Ch-Km	14,255,102	15,652,102	17,186,008	18,870,237	20,719,520	22,750,033
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	434,783	454,783	475,703	497,585	520,474	544,416
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	a1	b1+2	3	3	3	3
Intelsat Domestic E/S	NR	c4	d4+115	e119+1	f120+42	162
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	132,653	145,653	159,927	175,600	192,809	211,704

aIntelsat earth station installed January 1969 - A model

bIntelsat earth station installed January and July 1981 - A and B models

cIntelsat earth station installed December and April 1981 - domestic use

dIntelsat earth station installed 1982 - domestic use

eIntelsat earth station installed August 1983 - domestic use

fIntelsat earth station installed 1984 - domestic use

CENTRAL AMERICA TELECOMMUNICATIONS
SUMMARY

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	607,021	676,931	746,425	827,660	918,084	1,018,780
Telex	7,193	8,247	8,498	8,754	9,508	10,341
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	4	7	8	8	8	8
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

BELIZE TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	4,526	6,250	8,645	9,942	11,433	13,148
Telex	94	168	210	224	250	280
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	1 ^b	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Central American Telecommunications Summary (see p 34)

^bIntelsat earth station installed July 1978 - A model

Note First year telephone data available 1981 - 1980 data derived

COSTA RICA TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	194,528	236,132	255,898	281,487	309,635	340,598
Telex	^b 893	995	1,018	1,049	1,143	1,245
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	NR	^c 1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Central American Telecommunications Summary (see p 34)^b1977 data updated to 1980^cIntelsat earth station installed November 1981 - A model

EL SALVADOR TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	64,584	75,920	86,316	96,673	108,273	121,265
Telex	563	558	580	599	658	723
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b ₁	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Central American Summary (see p. 34)

^bIntelsat earth station installed August 1978 - A model

Note First year telephone data available 1981 - 1980 derived

BAHAMAS TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	68,080	71,883	75,071	78,073	81,195	84,442
Telex	263	273	284	295	306	318
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	NR	NR	NR	NR	NR	NR
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Caribbean Summary (see p 42)

CARIBBEAN TELECOMMUNICATIONS
SUMMARY

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	1,308,346	1,328,438	1,410,741	1,472,222	1,536,452	1,603,618
Telex	5,377	5,612	5,859	6,107	6,369	6,642
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	7	8	8	8	8	10
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR
Intra LANer	5 cable system 627 VF's 557,646 Ch-Km					

NICARAGUA TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	57,863	54,550	51,237	56,360	61,996	68,195
Telex	334	419	402	425	467	513
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b1	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Central American Summary (see p. 34)

^bIntelsat earth station installed November 1972 - A model

Note 1981 telephones is derived number - 1980 and 1982 are hard numbers

PANAMA TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	176,477	191,913	212,992	232,161	253,055	275,829
Telex	2,984	3,567	3,715	3,774	3,962	4,160
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b1	c1+1	2	2	2	2
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Central American Summary (see p. 34)

^bIntelsat earth station installed September 1968 - A model

^cIntelsat earth station installed April 1981 - A model

HONDURAS TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	27,421	30,544	33,667	38,717	44,524	51,202
Telex	1,022	1,177	1,453	1,556	1,789	2,057
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	NR	NR	^b 1	1	1	^c 1+1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Central American Summary (see p. 34)

^bIntelsat earth station installed December 1982 - A model

^cIntelsat earth station installed February 1985 and the December 1982 earth station retired - A model

Note 1981 telephones is derived number - 1980 and 1982 are hard numbers

GUATEMALA TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	81,622	89 646	97,670	112,320	129,168	148,543
Telex	1,303	1,363	1,120	1,127	1,239	1,363
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	NR	b1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Central American Summary (see p. 34)

^bIntelsat earth station installed July 1981 - A model

BARBADOS TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	54,071	66,679	72,850	76,492	80,316	84,331
Telex	142	149	156	163	171	179
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b1	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Caribbean Summary (see p 42)

^bIntelsat earth station installed October 1972 - A model

DOMINICAN REPUBLIC TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	155,400	165,253	175,054	185,557	196,690	208,491
Telex	900	945	992	1,041	1,093	1,147
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b ₁	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Caribbean Summary (see p. 42)^bIntelsat earth station installed March 1975 - A model

GRENADA TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	5,422	5,648	5,873	6,107	6,351	6,668
Telex	18	26	36	39	43	48
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	NR	NR	NR	NR	NR	NR
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Caribbean Summary (see p 42)

Note 1980 derived telephone data - 1981 is hard telephone data

HAITI TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	34,900	36,645	38,477	40,400	42,420	44,541
Telex	347	364	382	401	421	442
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b ₁	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Caribbean Summary (see p. 42)

^bIntelsat earth station installed April 1976 - A model

Note The only data available for telephones was 1980

JAMAICA TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	117,252	119,402	124,258	129,228	134,397	139,772
Telex	301	313	325	338	351	365
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	^b 2	2	2	2	2	2
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Caribbean Summary (see p 42)

^bIntelsat earth stations operational December 1970 and December 1971 - both A models

NETHERLANDS ANTILLES TELECOMMUNICATIONS^a

[NR = No Record]

	1980	1981	1982	1983	1984	1985
Telephones	67,664	69,916	72,168	75,054	78,056	81,178
Telex	782	813	845	878	913	949
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b ₁	c ₁ +1	2	2	2	d ₂ +1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Caribbean Summary (see p. 42)

^bIntelsat earth station installed May 1978 - A model

^cIntelsat earth station installed April 1981 - A model

^dIntelsat earth station planned installation December 1985 - B model

Note: First year telephone data available 1982 - years 1980 and 1981 derived

PUERTO RICO TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	651,388	631,458	678,447	705,584	733,827	763,159
Telex	2,147	2,232	2,321	2,413	2,509	2,609
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	NR	NR	NR	NR	NR	b ₁
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Caribbean Summary (see p 42)

^bPlanned operational December 1985 standard A station Atlantic

TRINIDAD/TOBAGO TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	116,502	120,380	124,258	129,228	134,397	139,772
Telex	339	352	366	380	395	410
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b1	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Caribbean Summary (see p 42)

^bOperational November 1, 1971 standard A station Atlantic Intelsat earth station installed
November 1971 - A model

Note First year telephone data available 1982 years 1980 and 1981 derived

U S VIRGIN ISLES TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	37,667	41,175	44,285	46,499	48,823	51,264
Telex	138	145	152	159	167	175
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	NR	NR	NR	NR	NR	NR
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in Caribbean Summary (see p 42)

SOUTH AMERICA TELECOMMUNICATIONS
SUMMARY

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	13,359,626	15,150,875	16,294,327	18,045,676	19,838,509	21,749,710
Telex	62,031	73,048	86,785	103,536	124,086	149,368
<u>Media</u>						
Microwave Ch-Km	40,951,267	46,752,267	53,397,678	61,013,913	69,746,880	79,765,089
Coaxial Cable Ch-Km	3,149,696	3,112,696	3,115,444	3,159,282	3,246,135	3,378,560
Multipair Cable Ch-Km	10,181,150	10,370,150	10,574,086	10,793,218	11,027,842	11,278,290
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	19	21	21	23	26	26
Intelsat Domestic E/S	14	25	82	119	227	227
Domestic E/S	NR	NR	NR	NR	NR	23
<u>Submarine Cable</u>						
Domestic Ch-Km	8,036,024	6,642,024	5,604,956	4,824,009	4,227,388	3,763,933
Intra-S A	557,646	557,646	557,646	557,646	557,646	557,646

ARGENTINA TELECOMMUNICATIONS^a

[NR = No Record]

	1980	1981	1982	1983	1984	1985
Telephones	2,759,736	2,880,754	3,041,475	3,345,622	3,680,184	4,048,202
Telex	^b 3,860	4,246	4,670	5,137	5,650	6,215
<u>Media</u>						
Microwave Ch-Km	6,491,936	7,296,936	8,201,756	9,218,774	10,361,902	11,646,778
Coaxial Cable Ch-Km	2,042,553	1,850,553	1,676,601	1,519,001	1,376,215	1,246,851
Multipair Cable Ch-Km	2,083,334	2,158,334	2,236,034	2,316,531	2,399,926	2,486,323
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	^c 2	2	^d 2+1	3	3	3
Intelsat Domestic E/S	NR	NR	^e 4	^f 4+29	933+6	39
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	96,000	96,000	96,000	96,000	96,000	96,000

^aIncluded in South American Summary (see p 53)

^bBasic data 1977 growth at 10% per year

^cIntelsat earth stations installed September 1969 and March 1972 - both A stations

^dIntelsat earth station installed December 1982 - A station

^eIntelsat earth station installed calendar year 1982 - domestic use only

^fIntelsat earth station installed calendar year 1983 - domestic use only

^gIntelsat earth station installed calendar year 1984 - domestic use only

BOLIVIA TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	127,114	135,100	144,300	151,515	159,090	167,045
Telex	^b 350	385	423	465	511	562
<u>Media</u>						
Microwave Ch-Km	40,000	48,000	57,600	69,120	82,944	99,533
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	^c 1	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in South American Summary (see p 53)

^bBasic data 1978 growth at 17% per year

^cIntelsat earth station installed December 1978 - A station

Note 1980 data derived - 1981 hard telephone data

BRAZIL TELECOMMUNICATIONS^a

[NR = No Record]

	1980	1981	1982	1983	1984	1985	1986
Telephones	6,494,000	7,496,000	8,536,000	9,577,392	10,592,595	11,651,854	
Telex	^b 37,406	46,757	58,446	73,057	91,321	114,151	
<u>Media</u>							
Microwave	25,625,851	29,392,851	33,713,600	38,669,499	44,353,916	50,873,941	
Ch-Km							
Coaxial Cable	NR	NR	NR	NR	NR	NR	
Ch-Km							
Multipair Cable	5,500,000	5,687,000	5,880,358	6,080,290	6,287,020	6,500,779	
Ch-Km							
Fiber Optical Cable	NR	NR	NR	NR	NR	NR	
Ch-Km							
<u>Satellite</u>							
Intelsat E/S	^c 3	3	3	3	3	3	^d 3+1
Intelsat Domestic E/S	^e 7	^f 7+9	916+40	^h 56+1	ⁱ 57+21	78	
Domestic E/S	NR	NR	NR	NR	NR	^j 23	
<u>Submarine Cable</u>							
Domestic Ch-Km	4,155,710	2,954,710	2,100,799	1,493,668	1,061,998	755,081	

^aIncluded in South American Summary (see p 53)

^bBasic data 1978 growth at 25% per year

^cIntelsat earth station installed February 1969, April 1975 and October 1978 - 2 A stations and 1 B station

^dIntelsat earth station to be installed July 1986 - A station

^eIntelsat earth station installed calendar years 1974, 1975, 1978, 1979 and 1980 - domestic use only

^fIntelsat earth station installed calendar year 1981 - domestic use only

^gIntelsat earth station installed calendar year 1982 - domestic use only

^hIntelsat earth station installed calendar year 1983 - domestic use only

ⁱIntelsat earth station installed calendar year 1983 - domestic use only

^jBrazil scheduled to launch domestic satellite February 1985 - 22 E/S + 1 command and control

CHILE TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	553,856	569,969	595,108	624,863	656,105	688,910
Telex	^b 2,210	2,431	2,674	2,941	3,235	3,558
<u>Media</u>						
Microwave Ch-Km	1,013,245	1,166,245	1,342,348	1,545,043	1,778,345	2,046,875
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	125,000	137,000	150,152	164,567	180,365	197,680
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	^c 2	2	2	2	2	2
Intelsat Domestic E/S	^d 1	^e 1+1	2	^f 2+1	^g 3+1	4
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in South American Summary (see p 53)

^bBasic data 1977 growth at 11% per year

^cIntelsat earth station installed July 1968 and October 1977 - both A stations

^dIntelsat earth station installed November 1977 - domestic use only

^eIntelsat earth station installed December 1981 - domestic use only

^fIntelsat earth station installed August 1983 - domestic use only

^gIntelsat earth station installed calendar year 1984 - domestic use only

COLOMBIA TELECOMMUNICATIONS^a

[NR = No Record]

	1980	1981	1982	1983	1984	1985
Telephones	1,524,000	1,623,105	1,747,689	1,922,457	2,114,702	2,326,172
Telex	^b 3,220	3,445	3,686	3,944	4,220	4,515
<u>Media</u>						
Microwave Ch-Km	4,009,434	4,434,434	4,904,484	5,424,359	5,999,341	6,635,271
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	1,269,231	1,236,231	1,204,089	1,172,782	1,142,289	1,112,590
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	^c 1	^d 1+1	2	2	2	2
Intelsat Domestic E/S	^e 3	3	^f 3+5	98+3	^h 11+7	18
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in South American Summary (see p 53)

^bBasic data 1977 growth at 6.7 percent per year

^cIntelsat earth station installed March 1970 - A station

^dIntelsat earth station installed June 1981 - A station

^eIntelsat earth station installed calendar year 1978 and 1979 - domestic use only

^fIntelsat earth station installed calendar year 1982 - domestic use only

^gIntelsat earth station installed calendar year 1983 - domestic use only

^hIntelsat earth station installed calendar year 1984 - domestic use only

EQUADOR TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	260,000	275,100	290,200	316,318	344,786	375,816
Telex	1,168	1,318	1,468	1,768	2,068	2,368
<u>Media</u>						
Microwave Ch-Km	1,179,775	1,284,775	1,399,120	1,523,642	1,659,246	1,806,919
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b1	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in South American Summary (see p 53)

^bIntelsat earth station installed August 1972 - A station additional A station planned for operation June 1988

Note 1980 hard telephone data - 1981 derived data

FALKLAND ISLANDS TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	580	^b 590	595	600	610	620
Telex	5	5	5	5	5	5
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	NR	NR	NR	^c 1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in South American Summary (see p 53)

^bMagneto telephones, 1 central office

^cIntelsat earth station installed November 1983

Note 1981 hard telephone data - 1980 and 1982 derived data

FRENCH GUIANA TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	13,687	18,134	19,627	21,589	23,747	26,122
Telex	20	23	23	26	27	30
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b1	1	1	1	c1+1	2
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in South American Summary (see p 53)

^bIntelsat earth station installed May 1974 - A station

^cIntelsat earth station installed calendar year 1984 - A station

GUYANA TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	24,484	26,562	28,468	30,460	32,592	34,873
Telex	100	139	142	146	150	155
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S ^b	1	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in South American Summary (see p. 53)

^bIntelsat earth station installed January 1979 - B station planned retirement December 1985
A station planned for operational status December 1989

Note 1980 derived telephone data - 1981 is hard telephone data

PARAGUAY TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	55,550	58,713	61,648	64,730	67,966	71,364
Telex	322	411	461	507	557	613
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b1	1	1	1	1	1
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in South American Summary (see p 53)

^bIntelsat earth station installed December 1977 - A station

Note 1980 derived telephone data - 1981 hard telephone data

PERU TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	^b 86,603	87,123	129,742	149,203	171,583	197,321
Telex	^c 2,400	2,520	2,646	2,778	2,916	3,062
<u>Media</u>						
Microwave	78,948	96,948	119,052	146,196	179,529	220,462
Ch-Km						
Coaxial Cable	NR	NR	NR	NR	NR	NR
Ch-Km						
Multipair Cable	112,676	120,676	129,244	138,420	148,248	158,774
Ch-Km						
Fiber Optical Cable	NR	NR	NR	NR	NR	NR
Ch-Km						
<u>Satellite</u>						
Intelsat E/S	^d 1	1	1	1	^e 1+1	2
Intelsat Domestic E/S	^f 3	^g 3+1	^h 4+5	ⁱ 9+3	^j 12+49	61
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aincluded in South American Summary (see p 53)

^bincomplete data

^cBasic data 1977 growth at 10% per year

^dIntelsat earth station installed July 1969 - A station

^eIntelsat earth station installed August 1984 - A station

^fIntelsat earth station installed calendar year 1979 - domestic use only

^gIntelsat earth station installed calendar year 1981 - domestic use only

^hIntelsat earth station installed calendar year 1982 - domestic use only

ⁱIntelsat earth station installed calendar year 1983 - domestic use only

^jIntelsat earth station installed calendar year 1984 - domestic use only

SURINAME TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	21,262	^b 21,262	27,495	30,244	33,268	36,595
Telex	195	238	332	395	474	568
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	^c 2	2	2	2	2	2
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in South American Summary (see p 53)

^bIncomplete data

^cIntelsat earth stations installed September 1978 and July 1979 - B stations A station planned for installation December 1987

URUGUAY TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	273,738	287,140	294,350	309,067	324,520	340,746
Telex	1,028	1,046	1,064	1,085	1,106	1,128
<u>Media</u>						
Microwave Ch-Km	NR	NR	NR	NR	NR	NR
Coaxial Cable Ch-Km	NR	NR	NR	NR	NR	NR
Multipair Cable Ch-Km	NR	NR	NR	NR	NR	NR
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	b ₁	1	1	1	^c 1+1	2
Intelsat Domestic E/S	NR	NR	NR	NR	NR	NR
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	NR	NR	NR	NR	NR	NR

^aIncluded in South American Summary (see p. 53)

^bIntelsat earth station installed December 1980 - B station

^cIntelsat earth station installed calendar year 1984 - A station

Note: 1980 derived telephone data - 1981 is hard telephone data

VENEZUELA TELECOMMUNICATIONS^a

[NR = No Record]

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Telephones	1,165,016	1,271,323	1,377,630	1,501,616	1,636,761	1,784,070
Telex	^b 9,747	10,234	10,745	11,282	11,846	12,438
<u>Media</u>						
Microwave Ch-Km	2,512,078	3,032,078	3,659,718	4,417,280	5,331,657	6,435,310
Coaxial Cable Ch-Km	1,107,143	1,262,143	1,438,843	1,640,281	1,869,920	2,131,709
Multipair Cable Ch-Km	1,090,909	1,030,909	974,209	920,628	869,994	822,144
Fiber Optical Cable Ch-Km	NR	NR	NR	NR	NR	NR
<u>Satellite</u>						
Intelsat E/S	^c 2	2	2	^d 2+1	3	3
Intelsat Domestic E/S	NR	NR	^e 3	3	^f 3+24	27
Domestic E/S	NR	NR	NR	NR	NR	NR
<u>Submarine Cable</u>						
Domestic Ch-Km	3,784,314	3,591,314	3,408,157	3,234,341	3,069,390	2,912,852

^aIncluded in South American Summary (see p 53)

^bBasic data 1978 growth at 14% per year

^cIntelsat earth station installed November 1970 and November 1980 - A stations

^dIntelsat earth station installed August 1983 - B station planned A station calendar year 1987

^eIntelsat earth station installed calendar year 1982 - domestic use only

^fIntelsat earth station installed calendar year 1983 - domestic use only

Note 1981 telephones is a derived number - 1980 and 1982 data is hard

APPENDIX C
NARRATIVE DESCRIPTIONS OF COUNTRIES IN ITU REGION 2
Canada

Country: Canada

N. America - Intelsat Member

Data Year: 1980

General Location of Country: The second-largest nation in the world in land area and very rich in natural resources. Canada is located north of the United States and is bordered on the east by the Atlantic Ocean and the west by the Pacific Ocean and Alaska on the north by the Arctic Ocean and Arctic Circle.

Population: 24,152,300 (1980)

Density: 2.4 persons/km²

Land Area: 9,976,139 sq/km

Language: English and French

Gross Domestic Product¹: \$249,310,340,000

Main Products: Leading Industries - manufacturing (steel, paper, electricity, aluminum, food processing, vehicles), mining (petroleum, copper, zinc, iron, lead, natural gas, asbestos, nickel, salt), agriculture (cattle, hogs, poultry, dairy products, wheat, barley, potatoes, corn, rapeseed tobacco), forestry, fishing, tourism.

Foreign Trade: Exports - manufactured goods, newsprint, wood, wood pulp, wheat, natural gas.

Imports - motor vehicles and parts, chemical products, tools, machinery, aircraft petroleum, communication equipment.

Telecommunications:

System Ownership: Private and Government

Subdivision if Available: There are some 600 Canadian telephone companies with 8 major corporations

Regulatory Environment: Canadian Radio - Television and Telecommunications (CRTC)

Regulatory: Restrictive Trade Practices Commission (RTPC) - authority over matters pertaining to but not restricted to the telecommunications industry.

¹In 1980 U.S. dollars.

Canada (continued)

Department of Communications (DOC) - charged to see that all Canadians have the best possible access to communications.

All radio communications in Canada except for matters covered by the Broadcasting Act are regulated under the Radio Act.

Telephone Demographics: Total telephones 15,560,264 (1980)

1. TeleSat Canada - Domestic Satellite Network

TeleSat is the sole supplier of domestic satellite services. TeleSat is a quasi government-owned communication operation. Ownership in addition to its federal government ownership the major telecommunication carriers are also owners. TeleSat as a member of Telecom Canada receives a share of the interprovincial trunked voice traffic but receives the majority of the video distribution. The video distribution consists of: (1) pay television from the cable TV companies; (2) direct broadcast satellite carriers; and (3) Canadian Broadcasting Corporation radio distribution. Additionally, a number of large Canadian corporations are looking at establishing their own private corporate networks outside of the local telco. TeleSat would be the carrier of record for this bypass.

CANADIAN SATELLITES

<u>Satellite Name</u>	<u>Frequency</u>	<u>Orbital Position</u>	<u>Launch Date</u>	<u>Transponders</u>	<u>Status</u>	<u>Owner</u>
Anik D	C	104.5°W	1982	24	Active	Telesat Canada
Anik A-1	C	104°W	1972	12	Retired	Telesat Canada
Anik B1	C/Ku	109°W	1978	12/6	Active	Telesat Canada
Anik 3 (A-2/3) ^a	C	114°W	1975	12	Active	Telesat Canada
Anik D2 ^b	C	114°W	1985	24	Active	Telesat Canada
Anik C2	Ku	105°W	1983	16	Active	Telesat Canada
Anik C3	Ku	117.4°W	1982	16	Active	Telesat Canada

Notes:

^aAnik A3 retired from active service and moved to higher orbit.

^bAnik D2 storage orbit pending either sale or moved to commercial svc..

Sources:

Satellite channel chart January/February 1985, Vol. 5, No. 1., The Official Westsat Communications Telecommunication Analysis and Research - Canadian Communication Vol. 3, 1984, The Yankee Group, Table 3-2, p. 58.

Canada (continued)

As sole satellite carrier has contracts for video distribution

1. Pay TV to the cable TV co
2. DBS carrier
3. for Canadian Broadcasting Corp.(CBC radio distribution)
2. Telecom - provides focal point to coordinate the activities of members interprovincial service in four basic areas: (1) technical; (2) financial; (3) regulatory; and (4) marketing.
Members are: (1) Bell Telephone of Canada; (2) Newfoundland Telco; (3) New Brunswick Tel; (4) Maritime Tel & Tel.; (5) The Island Telco; (6) Alberta Government Tel; (7) Saskatchewan Govt Tel,; (8) Manitoba Tel; (9) British Columbia Tel; and (10) TeleSat Canada and some 590 other independents.
3. Canadian National and Canadian Pacific (CNCP) - only competition to Telecom Canada members. Joint venture between Canadian National (a Crown Corporation - government-owned and operated at arm's length from Parliament) and Canadian Pacific Railroad investor-owned. CNCP is the sole provider of Telex in Canada.
4. Communications Services -
Data - CNCP - TLX Telecom - TWX. Telenet and Tymnet spilled over to Canada both essentially a packet-switched network with different sized packets - split again - CNCP - Tymnet Infoswitch Telecom - Telenet - Datapac - Private line service are growing very strong with good revenues still only fraction of total telecom market. Digital data services have just recently been introduced to the Canadian user in the form of a Dataphone Digital Service which is very similar to its namesake in the United States offered by American Telephone & Telegraph Co. An additional service offered was via satellite called Strataroute 2000 and conference 600. Strataroute 2000 is a dedicated customer premises to customer premises type service offering integrated digital voice, data and video communications. Strataroute 2000 is a SBS-type service using TDMA across the ANIK C satellites. This system is operating in C-band as opposed to Ku-band which SBS is operating. Conference 600 is as the name implies, a teleconferencing-originated digital satellite offering. This service operates again at C-band in a TDMA environment with video compression to 1.544 Mbps line.

Canada (concluded)

Voice - Telecom Canada is the majority supplier of all voice services within Canada. However, CNCP has filed with the CRTC to provide alternative long distance voice services within Canada. In the filing, CNCP indicated it would offer a price differential over Telecom of Canada only between designated sites covered by federal regulations. It appears as though CNCP is attempting to operate in the voice area similar to the way the specialized voice carriers do in the United States. These carriers being MCI, Sprint, Skylink, etc.

International - Canadian international is handled exclusively by TeleGlobe Canada, a Crown corporation. This corporation was established to handle all of Canada's external telecommunication services and, as such, is a member of Intelsat. There is no reported interrelationships between TeleGlobe and TeleSat due to the double hop problem. There is, of course, interconnection between TeleGlobe and the terrestrial long-haul carrier (Telecom and CNCP).

There was just recently, within the last 6 months or so, an agreement signed between Canada and the United States allowing Satellite Business Systems (SBS) to transmit services from the United States to Canada without entering the Canadian domestic network. It is expected that other United States other specialized common carriers (OCC's) may be planning to enter this market.

Resellers - If the application of CNCP is approved by the CRTC, the door will be open to the establishment of reseller in a big way. Presently there are two or three very small resellers operating in British Columbia telephone territory along the border of the United States.

Mexico

Country: Mexico

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Northernmost country of Central America bordered on the north by the United States, southeast by Guatemala and Belize, east by the Caribbean Sea, and on the west by the Pacific Ocean.

Population: 73,171,478 (1980)

Density: 37.0 persons/km²

Land Area: 1,972,547 sq/km

Language: Spanish

Gross Domestic Product¹: \$120,097,000,000

Main Products: Leading Industries - trade and services, manufacturing (steel, petroleum products, cement, automobiles, fertilizers, textiles, paper, aluminum, electricity), tourism, agriculture (sugarcane, coffee, cattle, cotton, wheat, rice, maize, fruits, vegetables), mining (petroleum, natural gas, coal, iron ore, copper, manganese, zinc, lead), fishing, construction.

Foreign Trade: Exports - petroleum, cotton, sugar, coffee, shrimp, zinc, lead and copper.

Imports - food, machinery, consumer goods.

Telecommunications:

System Ownership: Government-owned and operated

Subdivision if Available:

Regulatory Environment: Secretaria de Comunicaciones y Transportes (SCT)

Regulatory: A department of the executive branch of the federal government.

The SCT is further divided into two agencies which provide public telecommunications. These agencies being:

1. Direccion General de Telegrafos Nacionales (DGTN) which operates the national and international telegraph services.
2. Direccion General de Telecomunicaciones (DGT) which operates the domestic and international telex, video distribution and broadcasting stations, data communications, rural and marine communications and international communications. The DGT also

¹1980 U.S. Dollars.

Mexico (continued)

operates part of the long-haul national microwave network and the Intelsat earth stations. Telefonos de Mexico SA (Telemex) which provides all domestic public telephone service is a mixed-ownership corporation. The Mexican government owns 51 percent of Telemex. The Board of Directors consists of 11 board members; 6 members represent the government. There are no independent telephone companies in Mexico.

Telephone Demographics²: Total telephones 4,532,557

Transmission Facilities:

1. Morelos 1 and 2 - Domestic Satellite Network System

Regulated most likely by the Direccion General de Telecomunicaciones (DGT) and solely owned by the DGT. Morelos is being constructed by Hughes Communication International as a hybrid C and Ku-band design of the Hughes HS-376 series satellites. the Morelos system is designed to provide television distribution, expanded telephony service and data transmission services throughout all of Mexico. It is planned that a large part of the television distribution will be educationally oriented through inexpensive ground stations. The Morelos satellites are scheduled to be launched in May and September of 1985 aboard the Space Shuttle. The planned orbital locations are 113.5°W longitude and 116.5°W longitude. Additionally, Mexico has indicated a desire for an orbital slot at 145°W longitude.

Morelos 1	C/Ku	113.5°W longitude	May 1985
Morelos 2	C/Ku	116.5°W longitude	May 1985

Mexico presently has a very extensive terrestrial network for television including 184 earth stations of varying sizes. Additionally, there are two trailer-mounted and mobile. Of the 184 domestic earth stations, there are 7 transmit/receive stations: Mexico City - 4, Tiajuana - 1, Cancun - 1, and Tulancingo - 1. The balance are TU RO's which have the capability to become transmit stations should the need arise.

²1980 reported numbers by country to AT&T long lines for publication World Telephone A Statistical Compilation as of January 1980.

Mexico (continued)

National Television Ground Station Network (1983)³

<u>Region</u>	<u>Antenna Diameter</u>		
	<u>5</u>	<u>7</u>	<u>11</u>
Mexicali	1	6	1
Hermosillo	13	8	1
Culiacan	5	14	1
Guadalajara		19	1
Merida	11	7	2
Oaxaca		20	1
Chihuahua		10	2
Torreon		7	
Leon		13	
Monterey		10	1
Tampico		9	
Veracruz		3	
Zona Centro (Puebla)		11	
Zona Metropolitana		1	6
Total	30	138	16
Grand Total: 184			

Presently, Mexico has plans for an additional 45 earth stations, either under construction or awaiting construction.

2. Microwave Network -

Mexico, as compared with other Latin American countries, has a highly developed national microwave network with excellent route diversity. The most commonly used bands are 6 GHz, 2 GHz, 4 GHz, and 7 GHz bands. It is interesting that the DGT and Telemex have totally separate facilities on most routes but share facilities on others. Service is provided for each other where possible to avoid duplication of routes and there is no financial settlements as in this country. Microwave usage: (a) DGT - distribution of TV programming to broadcaster studios; and (b) Telemex - solely for voice communications.

3. Communications Services -

Data - DGTN - Telegraph DGT - TLX. The demand for domestic telegram has steadily fallen since the mid 1970's. This decline is because the telegraph service was used as a substitute for the poor mail service. The DGTN is planning to modernize the telegraph system which should stem the

³AIAA - 84-0716 Mexico's First Domestic Satellite, Miguel E. Sanchez-Ruiz and Bruce & Elbert, p. 316, Table 4.

Mexico (continued)

decline in its use. The telex system, on the other hand, is growing quite nicely. During the 1970's, it grew at about 9 percent per year. During the 1980's, it is expected to grow at about 5.4 percent per year.

Voice - Telmex - Telephone service is divided into three distinct divisions: (a) local service; (b) long distance service; and (c) international service. Telmex has operating authority over the local and long distance, while DGT assumes the authority for all international traffic. Telephone installation has proceeded at an average annual growth rate of 13 percent⁴ through the early to late 70's. During the late 70's and into the 80's, this average annual growth rate appears to have slipped to around 8 to 9 percent. Telmex has been spending large sums of dollars to upgrade the country's switching capacity as well as adding more facilities.

International - DGT - International telephone traffic has been segregated into two unique groups: (1) North America and Caribbean basin; and (b) the rest of the world. The switching hierarchy is again divided into 2 levels: Mexico City the highest, followed by Chihuahua and Hermosillo at the second level. The second level generally handles North American traffic. Interconnection with the United States at Dallas, Texas. All other international traffic exits via Mexico City.

Resellers - There are none.

⁴Arthur D. Little, p. 224, Volume 2.

Mexico (concluded)

MEXICO - DOMESTIC TELEX SUBSCRIBER MIX

INDUSTRIAL	25%
COMMERCIAL	19%
BANKING AND FINANCE	12%
FEDERAL GOVERNMENT	10%
OTHER	34%

MEXICO - DOMESTIC TELEGRAPH OFFICES

MAIN OFFICES	1,356
RADIOTELEGRAPH OFFICES	45
BRANCH OFFICES	63
TELEPHONE OFFICES	2,045
RADIOTELEGRAPH STATIONS	21
RADIOTELEPHONE STATIONS	<u>45</u>
TOTAL	3,575

Argentina

Country: Argentina

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Argentina and Chile occupy the extreme southern portion of South America. Argentina stretches some 3,700 Km north to south. Argentina shares a common border with Chile to the west and south, the Atlantic Ocean to the east and south (some 2,580 Km) and Uruguay and Brazil to the east and Bolivia and Paraguay to the north.

Population: 27,261,500

Density: 9.9 persons/km²

Land Area: 2,766,889 km²

Language: Spanish

Gross Domestic Product¹: \$102,500,000,000

Main Products: Manufacturing (steel, food processing, textiles, chemicals, vehicles, machinery, petroleum refining), agriculture (cattle, sheep, hogs, corn, wheat, cotton, citrus fruits, rye, alfalfa), mining (petroleum, gas, coal, iron ore, salt, uranium).

Foreign Trade: Exports - meat, corn, wheat, hides and skins, wool, quebracho extract, linseed.

Imports - nonelectric machinery, iron, steel, motor vehicles, paper and paperboard.

Telecommunications: N/A

System Ownership: Empresa Nacional de Telecomunicaciones (ENTEL)

Subdivision if Available: N/A

Regulatory Environment: Run by the Secretary of State for Communication

Telephone Demographics²: 2,759,736 telephones. ENTEL is responsible for the domestic as well as international telephone and telex service. Prior to 1946, ITT owned and operated the communication plant. Currently, there are two small privately held telephone companies owned by L.M. Ericsson providing less than 10 percent of the telephones. ENTEL's administrators have decided that to make the administration easier, decentralization was necessary. As a result, five operating regions were established: (1) Metropolitan;

¹In 1980 U.S. dollars.

²1980 data.

Argentina (concluded)

(2) Central-east; (3) Northeast; (4) Northwest; and (5) South. These regions are structured similar to our (U.S.) recently established regional holding companies.

Transmission Facilities: Demand for all types of public communication services far exceeds the supply of facilities. It is estimated that some 700,000 persons are awaiting telephony service alone.

ENTEL, due to: (1) demand for service; (2) age of switching gear (some exchanges date back to 1926-1927 era) and poor quality of cable plant has established very optimistic growth and replacement plans for the near term. ENTEL is planning the installation of approximately 3.5 million telephony main lines by 1986. The switching hierarchy has four levels similar to ours in the U.S.; however, we only have five.

Bolivia

Country: Bolivia

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Is completely landlocked, remote and dominated by high mountains. Bolivia and Utah have many similarities in area and geography. In the northwest is Peru, southwest is Chile, southeast Paraguay, south, Argentina and to the north and east, Brazil.

Population: 5,120,530

Density: 4.6 persons/km²

Land Area: 1,098,581 km²

Language: Spanish, Quechua, Aymara

Gross Domestic Product¹: \$4,500,000,000

Main Products: Agriculture (potatoes, corn, sugarcane, cassava, cotton, barley, rice, wheat, coffee, bananas, llamas, alpacas), mining (tin, petroleum, natural gas, lead, zinc, copper, tungsten, bismuth, antimony, gold, silver, sulfur, iron ore), manufacturing (textiles, handicrafts, food processing).

Foreign Trade: Exports - tin, antimony, tungsten, zinc, silver, lead, oil, natural gas.

Imports - flour, motor vehicles.

Telecommunications: N/A

System Ownership: Government/private industry

Subdivision if Available: N/A

Regulatory Environment: Under the Minister of Communication

Telephone Demographics²: 135,100 telephones. The Minister of Communication has a Subsecretary of Communication and him a Director General of Telecommunication (DGT). This Directorate provides a rudimentary magneto telephone and HF radiotelephone service to those parts of the country that are not connected to the public telephony network. The DGT is also responsible for regulating: (1) use of the frequency spectrum; (2) licensing of fixed and mobile radio communications; and (3) setting of public telecommunication tariffs. The national long-haul carrier Empresa Nacional de Telecomunicaciones (ENTEL), a

¹In 1980 U.S. dollars.

²1981 data.

Bolivia (concluded)

government-owned and operated organization, does not provide any telephone service but exists solely to provide long-haul inter-departmental and international communications. ENTEL provides all public telex and telegraph service as well as operating the Intelsat earth station. Local telephone service is provided by a growing number of local independent telephone companies.

Transmission Facilities: N/A

Brazil

Country: Brazil

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Fifth largest country in the world and slightly larger in area than the United States. Brazil has borders with every country in South America except Chile and Equador.

Population: 123,675,000

Density: 14.5 persons/km²

Land Area: 8,511,965 km²

Language: Portuguese

Gross Domestic Product¹: \$187,000,000,000

Main Products: Agriculture (cattle, coffee, corn, rice, sugarcane, rubber, cocoa, soybeans), manufacturing (steel, automobiles, plastics, paper, alcohol, chemicals, machinery, consumer goods), mining (iron ore, manganese, coal, petroleum, bauxite, nickel), construction.

Foreign Trade: Exports - industrial products, cocoa, coffee, soybeans, sugar, iron ore.

Imports - petroleum, wheat, machinery.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: Ministry of Communications

Telephone Demographics²: 6,494,000 telephones

The National Communication Council controls: (1) licensing; (2) regulation; (3) standardization; and (4) planning for communications agencies. These include: (1) Telecommunicacoes Baasileiros, S.A. (Telebras) - telephone holding company which controls Empresa Brasileria de Telecommunicacoes (Embratel) - the long-haul and international carriers; (2) Departmenta Nacional de Telecommunicacoes - (DENTEL) - controls radio equipment licensing and frequency allocation, and monitors the radio spectrum; (3) Empresa Brasileria de radiodifuso (Radiobras) - the national radio broadcasting service; and (4) Empresa

¹In 1980 U.S. dollars.

²1980 data.

Brazil (concluded)

Brasileira de Casseios e Telegrafos (ELT) - controls the public postal and telegraph service. It is interesting that with all this regulation, the subscriber, to the telephone network, is free to provide his own PABX, PBX and key set equipment from Telebras. Modems, approved types can be provided by Embratel as part of the data service. To subscribe for service a new subscriber is required to purchase shares in his local telephone company.

Transmission Facilities: Brazil's present telecommunication services are very inadequate by U.S. standards to include old switching technology (rotary and step-by-step switching equipment), old cable (underground and drop cable) and the instruments themselves. In 1974 Brazil initiated a five-year plan for significant investment in the national telephone plant in total. However, due to economic hard times in the late 1970's, their outlay was drastically reduced. The telex system was reorganized and in November 1974 and started the National Telex Network increasing number of lines, terminals, switches and availability resulting in fantastic growth and demand for this service.

Chile

Country: Chile

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Chile to the east and south has a common border with Argentina, to the east with Bolivia, north, Peru, and to the west, the South Pacific Ocean. In addition, Chile has several dependencies in Pacific Ocean they are: Easter Island, Juan Fernandez, Chilean Antarctic territory, Diego Ramirez Islands and Salay Gomez Islands, San Ambrosio Island, and San Felix Island. All these islands are located in the South Pacific.

Population: 11,381,700

Density: 15.0 persons/km²

Land Area: 756,945 sq/km

Language: Spanish

Gross Domestic Product¹: \$17,087,600,000

Main Products: Mining (copper, iron ore, sodium nitrate, coal), manufacturing (steel, textiles, food processing, consumer goods), agriculture (wheat, sugar beets, livestock, potatoes, corn, beans).

Foreign Trade: Exports - copper, iron ore, nitrates, coal.

Imports - electrical machinery, chemical products, cereals, crude petroleum.

Telecommunications: N/A

System Ownership: Public owned

Subdivision if Available: N/A

Regulatory Environment: Ministry of Transportation and Telecommunication

Telephone Demographics²: 553,856 telephones

Actual regulations are administered and regulated through the Subsecretary of Telecommunications which establishes technical standards and controls, issues compliance with regulations, manages RF spectrum allocation, regulates internal telecommunication and manages internal telecommunication. Public telephone service is provided by three companies which have effectively divided the country into thirds. The break-up is as follows: (1) Compania de

¹In 1980 U.S. dollars.

²1980 data.

Chile (concluded)

Telefonos de Chile (CTC) handling over 96% of the lines in service; (2) Companio Nacional de Telefonos de Valdivia in the middle part of the country with some 3.4% of the lines in service; and (3) Companio de Telefonos de Corkaique in the southern part of the country with only .4% of the total lines. Long-haul transmission is provided by Empresa de Telecomunicacione (ENTEL) which operates all microwave and Intelsat earth station (international and domestic). Additionally, all international channels for telegraph and telex are supplied.

Transmission Facilities: Chile's telecommunication plant is way underdeveloped in terms of main lines (local) and long-haul trunks. Additionally, there is no redundancy for the long-haul backbone network. Chile has no DDD service which must be handled by long distance operators. It is planned to introduce automatic DDD. Telex plant is being upgraded; however, there is still significant demand for the service. Planned expansion was little discussed. Chile operates INTELSAT antenna for both international and domestic services through ENTEL.

Regulatory: N/A

Colombia

Country: Colombia

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Colombia as a country is larger than Texas and California combined with coastline on the Caribbean Sea on the north, and Pacific Ocean to the west. On the Northwest is Panama on the northwest, on the northeast by Venezuela, on the southeast by Brazil, and on the south by Peru and Equador.

Population: 27,417,400

Density: 24 persons/km²

Land Area: 1,138,914 sq/km

Language: Spanish

Gross Domestic Product¹: \$22,795,000,000

Main Products: Agriculture (coffee, cattle, bananas, sugar, tobacco, cotton, rice, wheat, potatoes), mining (petroleum, gold, silver, platinum, emeralds, coal, iron, nickel), food processing, manufacturing (textiles, steel, chemicals).

Foreign Trade: Exports - coffee, petroleum, coal, bananas, cotton, beef, sugar.

Imports - machinery, motor vehicles, consumer goods.

Telecommunications: N/A

System Ownership: Government and private industry

Subdivision if Available: NA

Regulatory Environment: Very structured and complex

Telephone Demographics²: 1,524,000 telephones

The Ministry of Communication is directly responsible for the coordination of all general policy making, for providing regulation and for coordinating public telecommunications. The ministry makes recommendation before tariff alterations are submitted to the National Planning Department's Tariff Board for approval. Tariff approval must be secured from Ministry of Communications, Ministry of Finance and Tariff Board. Expansion plans of all the telephones are also reviewed at this level. The Ministry of Communication is organized

¹In 1980 U.S. dollars.

²1980 data.

Colombia (concluded)

as follows: Under the Minister is a Vice Minister, a Secretary General and five operating divisions: (1) Administration Division; (2) Audio-visual and Publicity Media; (3) Legal; (4) Radio; and (5) Telephone, Telegraph and Postal Services.

The Radio Division handles spectrum regulation and monitoring as well as the technical requirements for radio equipment.

The Telephone, Telegraph and Postal Service Division has following subsections: (1) engineering section with switching and transmission groups; (2) evaluation section with technical and economic administrative groups; and (3) postal section.

There are some 40 department and municipal telephone companies plus a national company Empresa Nacional de Telecomunicaciones (TELECOM). TELECOM provides: (1) long-distance telephone service; (2) national telegraph and Gentex; (3) toll switching; (4) local service in some small towns; and (5) all international services.

TELECOM has been authorized to take over local companies or to develop local companies where none exist with proper approval. Since 1969, the number of local companies has declined and standardization of equipment has improved. The ultimate goal is to have one national telecommunication system.

Transmission Facilities: Starting in the 70's, there was significant effort devoted to the expansion of the telephone system in terms of facilities expansion local and long-haul, telephone instruments, and telephone switches. This expansion is partially financed by a new subscriber connection charge. The expansion is taking place mostly in the major cities and then to the rural area. Telex and Gentex as well as telegraph services are provided to all towns with populations greater than 3,000. The telex network is also expanding with the addition of electronic switches and electronic as well as electro-mechanical terminals. High speed data communication is very limited. Satellite communication for domestic as well as international service has a high priority within Telecon. Colombia is one of the more progressive South American countries as it relates to satellite communications.

Regulatory: N/A

Equador

Country: Equador

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Equador is about the size of Nevada with the equator passing through the country. Located on the west coast of South America bordered by the Pacific Ocean on the west, Colombia to the north, and Peru to the south.

Population: 8,497,870

Density: 29.9 persons/km²

Land Area: 283,561 km²

Language: Spanish (official), Quechua, Jivaro

Gross Domestic Product¹: \$8,570,000,000

Main Products: Agriculture (bananas, cocoa, coffee, sugarcane, cattle, dairy-ing), mining (petroleum, gold, copper, sulfur, natural gas), manufacturing (textiles, cement, lumber, tobacco products, sugar), fishing.

Foreign Trade: Exports - petroleum, bananas, coffee, cocoa, sugar, seafood.

Imports - machinery, vehicles, paper, textiles, consumer goods.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 260,000 telephones

All telecommunications services are provided by Instituto Ecuatoriano de Telecomunicaciones (IETEL) one of the three government agencies in the Ministry of Public Works and Communications. IETEL was found as a national telecommunication monopoly, legally taking over several small telephone companies. IETEL, organized under a General Manager and National Technical and Financial Director. Equador is divided telecommunication-wise into two regions with its own similar organization. Through a Frequency Management Department (Direccion de Frecuencias), IETEL controls all frequency assignments and regulates the 300

¹In 1980 U.S. dollars.

²1980 data.

Equador (concluded)

commercial radio stations. There still exists outside of IETEL a private telecommunications market mainly PBX's and telephone sets.

Transmission Facilities: Equador's public telecommunication facilities are relatively underdeveloped in terms of switching, facilities, and key sets. There are plans to significantly modernize the total telecommunication plant. Microwave is being used quite extensively for the long-haul transmission. Public telegraph and telex are provided by IETEL also. There is significant effort to updating and expanding the telex network with electronic switches and terminals. Satellite communications are handled by Intelsat; however, Equador is very interested in participating in a regional satellite network should one develop.

Falkland Islands

Country: Falkland Islands

S. America - Intelsat Dependency Member

Data Year: 1980

General Location of Country: Located in the south Atlantic some 480 miles northeast of Cape Horn and 500 miles east of Argentina. This island a British Crown Colony and also claimed by Argentina and known as the Malvinas. England and Argentina had a brief confrontation in 1983 over these islands.

Population: 2,086

Density: 5.8 persons/km²

Land Area: 12,173 km²

Language: English

Gross Domestic Product¹: N/A

Main Products: Sheep farming.

Foreign Trade: Exports - Sheep products.
Imports - all necessities.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 590 telephones

Transmission Facilities: N/A

¹Figures included with United Kingdom (England).

²1981 data The World Telephones footnote no. 340, p. 107.

French Guiana

Country: French Guiana

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Located on the northern coast of South America bordered on the north by the Atlantic Ocean, on the east and south by Brazil, and on the west by Suriname. Member of the French community of nations. Main space port of France.

Population: 71,428

Density: 1.3 persons/km²

Land Area: 91,000 km²

Language: French

Gross Domestic Product¹: N/A

Main Products: Agriculture (cattle, bananas, pineapples, sugarcane, fruits and vegetable), mining (gold and bauxite).

Foreign Trade: Exports - gold.

Imports - petroleum products, manufactured products.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 13,687 telephones

Transmission Facilities: N/A

¹Figures included with France.

²1980 data.

Guyana

Country: Guyana

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Guyana is about the size of Idaho and largely covered by a thick, uninhabited tropical rain forest. Located on the northern coast of South America, bordered on the north by the Atlantic Ocean.

Population: 855,400

Density: 4.0 persons/km²

Land Area: 214,969 km²

Language: English (official), East Indian dialects

Gross Domestic Product¹: \$472,000,000

Main Products: Mining (bauxite, gold, diamonds), agriculture (rice, sugarcane, palm kernals, coffee, fruits, vegetables), processing bauxite into alumina, food processing, fishing, forestry and lumbering.

Foreign Trade: Exports - sugar, bauxite, alumina, rice, gold, diamonds, shrimp.

Imports - machinery, petroleum, textiles, motor vehicles, wheat.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: Guyana Telephone Co. (GUYTEL Co.)

Telephone Demographics²: 26,562 telephones

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

²1981 data.

Paraguay

Country: Paraguay

S. America - Intelsat Member

Data Year: 1980

General Location of Country: About the size of California and is one of the poorest nations in South America. Argentina lies to the south and west, Brazil to the northeast, and Bolivia to the northwest.

Population: 3,299,170

Density: 8.1 persons/km²

Land Area: 406,752 km²

Language: Spanish, Guaraní

Gross Domestic Product¹: \$3,087,800,000

Main Products: Agriculture (wheat, corn, manioc, sweet potatoes, beans, rice, sugarcane, livestock, fruits, vegetables), lumbering and forestry, food processing, manufacturing (electricity, oil refining, cement, consumer goods).

Foreign Trade: Exports - meat, timber, oilseed, tobacco, cotton, quebracho extract, hides.

Imports - machinery, food, steel, consumer goods.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 58,713 telephones

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

²1981 data.

Peru

Country: Peru

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Peru is almost as large as Texas and among the world leading nations in fishing and the mining of lead and zinc. Ecuador and Colombia lie on the north, Brazil and Bolivia on the east, Chile on the south and the Pacific Ocean on the west.

Population: 18,025,200

Density: 14.0 persons/km²

Land Area: 1,285,216 km²

Language: Spanish, Quechua

Gross Domestic Product¹: \$13,525,000,000

Main Products: Agriculture (sugarcane, cotton, rice, wheat, coffee, potatoes, livestock, fruits, vegetables), mining (petroleum, iron ore, copper, gold, silver, lead, zine, tungsten, manganese, coal), fishing, food processing, manufacturing (textiles, cement, leather products, plastics, chemicals).

Foreign Trade: Exports - fish meal, copper, sugar, iron ore, silver, cotton, zinc, coffee, lead.

Imports - machinery, food, trucks, chemicals.

Telecommunications: N/A

System Ownership: Government and public ownership

Subdivision if Available: N/A

Regulatory Environment: Minister of Transportation and Communication

Telephone Demographics²: 86,603

Under the minister is the Director General who has the responsibility for international telecommunications affairs and administration of national telecommunications. Under the Director General is the Director of Telecommunication who has responsibility for spectrum management and radio licensing. There are two public carriers, Empresa Nacional de Telecomunicaciones del Peru (ENTEL) and Compania Peruana de Telefonos, S.A. (CPT). ENTEL is partially

¹In 1980 U.S. dollars.

²1980 data.

Peru (concluded)

state-owned and was found by two other telecommunication companies. Public telegraph was formerly the responsibility of the Directorate of Posts and Telegraph (Direccion de Correos y Telegrafos or CyT) which is a separate government department. ENTEL assumed ownership in 1978. Service is handled as follows: ENTEL - public telephone service - national long-haul and international facilities - public telex service - national and international. National broadcasting authority was Entel facilities for distribution of radio and television program.

CPT - Serves the capital district which has about 80% of the Peruvian telephones. Service costs as follows: residential service about \$175 for new service to \$450 for commercial service plus a \$100 connection charge.

Transmission Facilities: Generally speaking, the Peruvian facilities are very poor and inadequate. Demand has outstripped supply. ENTEL is in the process of improving this in two ways: (1) installation of a domestic satellite system using Intelsat; and (2) installation of in-land microwave routes. Currently, the telephone switching hierarchy is three level with the addition of automatic exchanges. ENTEL took over the public telegraph and telex services in 1978 and has plans to improve the service availability over the next few years. Peru has no data services as we (U.S.) know them. Peru operates internationally via Intelsat and has in place a domestic network using Intelsat.

Suriname -

Country: Suriname

S. America - Intelsat Member

Data Year: 1980

General Location of Country: Somewhat larger than the state of Georgia, Suriname is the smallest and newest of the South American nations. Suriname is the fourth-leading producer of bauxite in the world. Guyana is to the west, Brazil to the south, French Guiana to the east, and the Atlantic Ocean to the north.

Population: 413,535

Density: 2.5 persons/km²

Land Area: 163,265 km²

Language: Dutch (official), English, Sranang Tongo

Gross Domestic Product¹: \$675,000,000

Main Products: Mining (bauxite), agriculture (rice, bananas, coconuts, fruits, vegetables), manufacturing (aluminum, electricity, food processing, clothing), forestry and lumbering, fishing.

Foreign Trade: Exports - bauxite, aluminum, alumina.

Imports - food, machinery, petroleum, steel, cotton, grain, consumer goods.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 21,262 telephones

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

²1980 data.

Uruguay

Country: Uruguay

S. America - Intelsat Member

Data Year: 1980

General Location of Country: About the size of Missouri. Brazil lies to the northeast, and Argentina to the west, and to the east and south, the Atlantic Ocean.

Population: 2,907,260

Density: 16.4 persons/km²

Land Area: 177,508 km²

Language: Spanish

Gross Domestic Product¹: \$7,292,000,000

Main Products: Agriculture (cattle, sheep, hogs, rice, wheat, corn, fruits, vegetables), manufacturing (food processing, electricity, leather products, glass, ceramics, furniture, clothing), forestry and lumbering, tourism, fishing, construction.

Foreign Trade: Exports - meat, wool, leather, fish, rice, shoes, glass, ceramics, cement.

Imports - petroleum, machinery, motor vehicles and aircraft, chemicals, iron and steel.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics²: 287,140 telephones

Transmission Facilities: N/A

¹In 1980 U.S. Dollars.

²1981 data.

Venezuela

Country: Venezuela

S. America - Interlsat Member

Data Year: 1980

General Location of Country: Larger than California, Oregon and Washington combined. Venezuela is the most prosperous country in South America. Bordered on the north by 1,750 miles of Caribbean Sea, Colombia lies to the west, Brazil to the south, and Guyana to the east.

Population: 15,267,700

Density: 16.7 persons/km²

Land Area: 912,050 km²

Language: Spanish

Gross Domestic Product¹: \$39,252,000,000

Main Products: Manufacturing (steel, motor vehicles, ships, oil refining, chemicals, food processing, textiles, cement), mining (petroleum, iron, diamonds, manganese), services, agriculture (live-stock, coffee, cocoa, corn, rice, sugar, tobacco, cotton, fruits, vegetables), tourism, forestry and lumbering.

Foreign Trade: Exports - petroleum and petroleum products, iron ore, coffee, cocoa.

Imports - machinery, steel, automobiles, wheat.

Telecommunications: N/A

System Ownership: Autonomous government institute

Subdivision if Available: N/A

Regulatory Environment: Minister of Transportation and Communication

Telephone Demographics²: 1,165,016 telephones

Within the Ministry there is the Direccion General of the Secretariat de Comunicaciones which has responsibility for regulating policies and planning for communications. The Direccion General de Comunicaciones is organized into three operating units: (1) Planning; (2) Engineering; and (3) Radio Broadcasting. The Planning office sets standards for quality of service offered by public carriers and establishment of a National Communications plan. The Engineering office controls the regulation and RF spectrum monitoring.

Compania Anonima Nacional Telefonos de Venezuela (CANTV) is the

¹In 1980 U.S. Dollars.

²1980 data.

Venezuela (concluded)

sole provider of telephone and telex services. Additionally, private leased voice circuits are provided for government and private users. The microwave system is used for distribution of video and radio broadcast programming.

Transmission Facilities: The transmission plant that is in place is good. However, there is not nearly enough to meet the growing demand. In terms of switching hierarchy, they use a system similar to the Bell System, a 5-level hierarchy. Due in part to the lack of interoffice facilities, a high number of unsuccessful call attempt happen. In addition to the lack of adequate facilities, there is a high turnover of personnel in all areas resulting in shortage of skilled and experienced personnel. The long-haul facilities use basically microwave radio with some ground cable system. The international facilities are handled primarily via Intelsat. The telex growth recently has been good due to the installation of new exchanges and terminal availability.

Belize

Country: Belize

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Formally British Honduras. Bordered on the north by Mexico, on the west and south by Guatemala and on the east by the Caribbean Sea.

Population: 164,777

Density: 7.2 persons/km²

Land Area: 22,965 km²

Language: English

Gross Domestic Product: N/A

Main Products: Sugar, citrus, forestry products and fishing

Telecommunications: N/A

System Ownership: Government and private

Subdivision if Available: N/A

Regulatory Environment: The domestic telecommunication are handled through the Belize Telecommunication Authority. The international telecommunication is currently being handled through Cable and Wireless (C&W); however, the contract of operation will expire in a couple of years at which time operation will revert to Belize Telecommunication Authority. The Belize Telecommunication Authority appears to operate like our FCC in terms of regulation.

Telephone Demographics¹: 6,250

Transmission Facilities: One microwave link between Intelsat earth station to the capital city. Future microwave expansion planned.

¹1981 data - 1980 data not available.

Costa Rica

Country: Costa Rica

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Has the highest standard of living in Central America. Bordered on the east by Panama, west and south by the Pacific Ocean and north by the Caribbean Sea and Nicaragua.

Population: 2,240,380

Density: 44.2 persons/km²

Land Area: 50,700 sq/km

Language: Spanish

Gross Domestic Product¹: \$4,250,000,000

Main Products: Agriculture (coffee, bananas, cattle, cocoa, maize, pineapples, sugarcane, tobacco, rice, potatoes), food processing, manufacturing (textiles, clothing, footwear, cigarettes, furniture, construction materials), mining (gold, salt).

Foreign Trade: Exports - coffee, bananas, beef, sugar, cocoa

Imports - paper products, machinery, iron and steel, pharmaceuticals, petroleum, chemicals, food, manufactured goods

Telecommunications: N/A

System Ownership: Government-owned

Subdivision if Available: N/A

Regulatory Environment: Instituto Costarricense de Electricidad (ICE)

Telephone Demographics: 194,528

Prior to 1963, the telephone was held in private hands consisting of approximately 10,000 manual lines basically in one area. The government took over its operation to include all of Costa Rica. With this takeover, the following structure was formally established. ICE's telecommunications sector is directly responsible for all internal services. The international traffic is handled by Radiografica Costarricense S.A. (RACSA). RACSA is wholly owned by ICE. RACSA operates as a separate entity; however, there is close coordination of all planning activity. Services are split out as follows: FACSA - telephone, telex, and telegraph throughout the world except to Mexico, Panama and Central America. Operator assisted traffic to the United States.

¹In 1980 U.S. dollars.

Costa Rica (concluded)

ICE - handles all automated traffic and Central America, Panama, Mexican and Spanish circuits.

Costa Rica has developed an extensive plan consisting of 5 stages of installation of a new modern telephone system. The telex network has been expanding and new modern switches have been installed to handle this demand.

Transmission Facilities: Extensive plans for expansion and implementation of service to areas not now having access to both telex and telephony.

Regulatory: N/A

El Salvador

Country: El Salvador

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Bordered on the north by Honduras and Guatemala and the south by the Pacific Ocean.

Population: 4,666,320

Density: 221.7 persons/km²

Land Area: 21,041 km²

Language: Spanish

Gross Domestic Product¹: \$3,100,000,000

Main Products: Agriculture (coffee, cotton, corn, millet, sugarcane, Henequen, beans, cattle, sheep, goats), mining (gold, silver), food processing, manufacturing (textiles, steel, cement, consumer goods), fishing (shrimp).

Foreign Trade: Exports - coffee, cotton, sugar, shrimp, textiles.

Imports - crude petroleum, iron and steel, fertilizers, medicines, paper.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: No record

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Guatemala

Country: Guatemala

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Bordered on the south and west by Mexico, on the east by Belize, Honduras and El Salvador, and the south by the Pacific Ocean.

Population: 7,113,280

Density: 65.3 persons/km²

Land Area: 108,889 km²

Language: Spanish (official), Maya

Gross Domestic Product¹: \$7,110,000,000

Main Products: Agriculture (coffee, cotton, bananas, sugarcane, cattle, corn, rice, beans, wheat, tobacco), manufacturing (tobacco products, chemicals, textiles, plastics, consumer goods), food processing, construction, mining (nickel, petroleum).

Foreign Trade: Exports - coffee, cotton, bananas, sugar, beef, wood, chicle.
Imports - iron and steel, textiles, pharmaceuticals, vehicles, petroleum, food, consumer goods.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 81,622

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Honduras

Country: Honduras

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Bordered on north by the Caribbean Sea, on the south by Nicaragua, on the west by the Pacific Ocean, El Salvador and Guatemala.

Population: 3,758,190

Density: 33.5 persons/km²

Land Area: 112,088 km²

Language: Spanish

Gross Domestic Product¹: \$2,067,000,000

Main Products: Agriculture (bananas, coffee, cattle, corn, beans, rice, sugarcane, tobacco, vegetables, fruits), forestry and lumbering, manufacturing (textiles, detergents, cement, paper, chemicals, food products, clothing), mining (gold, silver, copper, lead, zinc).

Foreign Trade: Exports - bananas, coffee, wood, silver, tobacco.

Imports - paper and paperboard, textile, yarn and fabrics, electrical machinery, petroleum products.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 27,421

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Nicaragua

Country: Nicaragua

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Located to the north of Costa Rica and South of Honduras, on the east, the Caribbean Sea, and the west by the Pacific Ocean.

Population: 2,513,910

Density: 19.3 persons/km²

Land Area: 130,000 km²

Language: Spanish (official), English, Indian dialects

Gross Domestic Product¹: \$1,319,000,000

Main Products: Trade and services, agriculture (coffee, cotton, sugarcane, cattle, bananas, corn, tobacco, rice, beans, fruits, vegetables), mining (gold, silver, gypsum), fishing, manufacturing (food processing, textiles, clothing, footwear, tobacco products).

Foreign Trade: Exports - cotton, meat, coffee, sugar, sesame, cottonseed.
Imports - insecticides, motor vehicles, pharmaceuticals, iron and steel, petroleum, machinery.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 57,863

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Panama

Country: Panama

L. America - Intelsat Member

Data Year: 1980

General Location of Country: The southern most of the central American countries, bordered on the east by Colombia, on the west by Costa Rica, on the north by the Caribbean Sea, and the south by the Pacific Ocean.

Population: 1,971,360

Density: 25.6 persons/km²

Land Area: 77,083 km²

Language: Spanish

Gross Domestic Product¹: \$2,306,000,000

Main Products: Agriculture (rice, bananas, corn, cocoa, abaca, tobacco, coffee, palm kernels, livestock), fishing, trade and services, manufacturing (food processing, oil refining, tobacco products, textiles, soap, cement), forestry and lumbering, mining (gold).

Foreign Trade: Exports - bananas, refined petroleum, shrimp, cocoa.

Imports - crude petroleum, motor vehicles, foodstuffs.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 176,477

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Bahamas

Country: Bahamas

L. America - Intelsat Dependency Member

Data Year: 1980

General Location of Country: The Bahamas contain more than 700 islands covering 90,000 square miles. They lie in a band like appearance approximately 500 miles long and 200 miles wide beginning 50 miles east of Florida bounded on the east by the Atlantic Ocean and on the west by the Caribbean Sea. Approximately 40 of the islands are inhabited.

Population: 244,692

Density: 17.6 persons/km²

Land Area: 13,935 km²

Language: English

Gross Domestic Product¹: \$825,000,000

Main Products: Tourism, banking, fishing, petroleum refining, agriculture (fruits and vegetables), cement, salt, chemicals.

Foreign Trade: Exports - petroleum products, tomatoes, salt, rum, seafood, cement, pulpwood.

Imports - food, manufactured products.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 68,080

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Barbados

Country: Barbados

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Barbados lies on the eastern edge of the Lesser Antilles. The east coast faces the Atlantic Ocean and the west coast faces the Caribbean Sea.

Population: 255,043

Density: 591.7 persons/km²

Land Area: 431 km²

Language: English

Gross Domestic Product¹: \$440,000,000

Main Products: Tourism, agriculture (sugarcane, corn, yams, fruits), sugar refining, manufacturing (rum, molasses, soup), fishing.

Foreign Trade: Exports - raw sugar, seafood, molasses, rum.

Imports - petroleum, meat, dairy products, automobiles, steel

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: The domestic telephone plant is owned by The Barbados Telephone Co. which is controlled by the Barbados Ministry of Information and Culture. The international telecommunication is owned by the Barbados External Communication (BEC) which is controlled by the Barbados External Communication. Regulatory environment appears very restrictive.

Telephone Demographics: 54,071

Transmission Facilities: Trunk lines only. No microwave.

¹In 1980 U.S. dollars.

Dominican Republic

Country: Dominican Republic

L. America - Intelsat Member

Data Year: 1980

General Location of Country: The Dominican Republic covers the eastern two-thirds of the island of Hispaniola. It has a 193-mile border with Haiti on the west. On the east, the Mona Passage separates it from Puerto Rico. On the south it is bordered by the Caribbean Sea and on the north, the Atlantic Ocean.

Population: 5,518,430

Density: 113.2 persons/km²

Land Area: 48,734 km²

Language: Spanish (official), French/English

Gross Domestic Product¹: \$4,695,000,000

Main Products: Agriculture (sugarcane, tobacco, vegetables, coffee, cocoa, bananas, rice, corn, cattle, poultry), food processing (sugar, molasses, rum), tourism, manufacturing (textiles, cement, bottles, paper, matches, tobacco products), mining (bauxite, gold, silver, iron ore, salt gypsum).

Foreign Trade: Exports - sugar, gold, silver, nickel, coffee, cocoa, bauxite, tobacco.

Imports - iron and steel, machinery, chemical and pharmaceuticals products, foodstuffs.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 155,400

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Grenada

Country: Grenada

L. America - Non Intelsat Member

Data Year: 1980

General Location of Country: Southern end of the Windward Islands, due north the island of Trinidad and Venezuela. Bordered on the east by the Atlantic Ocean and on the west by the Caribbean Sea. The island of Grenada was invaded in 1984 by United States forces resulting in a change of government. A new government was recently elected and installed. It is expected that the island of Grenada will apply for membership in Intelsat, and the growth in other forms of telecommunications will experience significant growth.

Population: 90,348

Density: 262.6 persons/km²

Land Area: 344 km²

Language: English

Gross Domestic Product¹: \$56,000,000

Main Products: Tourism, agriculture (nutmeg, cocoa, bananas, fruits, vegetables, sugarcane, cotton, spices), fishing, food processing.

Foreign Trade: Exports - nutmeg, cocoa beans, mace, bananas.

Imports - petroleum products, food, consumer goods.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: Domestic telecommunication handled by Ministry of Construction and Public Utilities. International telecommunication handled by Cable and Wireless (E&W)

Telephone Demographics: 5,648

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Haiti

Country: Haiti

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Haiti covers the western one-third of the island of Hispaniola. It has a 193-mile border with the Dominican Republic on the east. On the west, the Windward Passage separates it from Cuba. On the south, it is bordered by the Caribbean Sea, and on the north, the Atlantic Ocean.

Population: 5,054,090

Density: 182.1 persons/km²

Land Area: 27,750 km²

Language: French (official), Creole

Gross Domestic Product¹: \$1,785,000,000

Main Products: Agriculture (coffee, sisal, sugarcane, rice, cocoa, poultry, vegetables, fruits), food processing, mining (copper, bauxite), tourism, manufacturing (textiles, soap, cement, assembly plants), fishing.

Foreign Trade: Exports - coffee, bauxite, sugar, sisal.

Imports - cotton textiles, foodstuffs, petroleum, machinery.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics: 34,900

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

Jamaica

Country: Jamaica

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Jamaica lies approximately 90 miles south of Cuba surrounded entirely by the Caribbean Sea.

Population: 2,214,120

Density: 201.4 persons/km²

Land Area: 10,991 km²

Language: English

Gross Domestic Product¹: \$2,426,797,300

Main Products: Agriculture (sugarcane, bananas, cattle, hogs, poultry, cocoa, coconuts, fruit, vegetables), mining (bauxite, gypsum), tourism, manufacturing and processing (alumina, rum, molasses, cement, chemicals, petroleum products, consumer products), fishing.

Foreign Trade: Exports - alumina, bauxite, sugar, bananas.

Imports - crude petroleum, automobiles.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: Jamaica Ministry of Public Utilities and Transport

Telephone Demographics: 117,252

Transmission Facilities: Most extensive microwave of all Caribbean countries

¹In 1980 U.S. dollars.

Neitherland Antilles

Country: Netherland Antilles

L. America - Intelsat Dependency Member

Data Year:

General Location of Country: Netherland Antilles lie about 15 to 40 miles off the northwestern coast of Venezuela. In process of separating from mother country.

Population: 250,338

Density: 260.5 persons/km²

Land Area: 961 km²

Language: Dutch (official), English and Papiamento

Gross Domestic Product: Included as part of Netherlands GNP

Main Products: Tourism, petroleum, refining, mining (phosphates).

Foreign Trade: Exports - petroleum products, mining (phosphates).

Imports - food, manufactured products.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: N/A

Telephone Demographics¹: 72,168

Transmission Facilities: N/A

¹First year data available 1982.

Puerto Rico

Country: Puerto Rico

L. America - Intelsat Dependency Member

Data Year: 1980

General Location of Country: Located east of the island of Hispaniola, separated by the Mona Passage, and west of the Virgin Islands, on the north, the Atlantic Ocean, and on the south by the Caribbean Sea.

Population: 3,615,598

Density: 406.4 persons/km²

Land Area: 8,896 km²

Language: English

Gross Domestic Product: Included as part of United States GNP

Main Products: Manufacturing (clothing, chemicals, electrical equipment, machinery), food processing, agriculture (sugarcane, coffee, tobacco, bananas, dairy products, poultry), tourism.

Foreign Trade: Exports - N/A

Imports - N/A

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: FCC

Telephone Demographics: 651,388

Transmission Facilities: N/A

Trinidad/Tobago

Country: Trinidad/Tobago

L. America - Intelsat Member

Data Year: 1980

General Location of Country: Trinidad-Tobago lie off the Venezuelan coast to the northeast. The islands are encompassed totally by the Caribbean Sea.

Tobago, the smallest of the two islands, is approximately 20 miles.

Population: 1,179,100

Density: 229.8 persons/km²

Land Area: 5,130 km²

Language: English (official), Spanish

Gross Domestic Product¹: \$4,335,000,000

Main Products: Mining (petroleum, natural gas), manufacturing (oil refining, chemicals, textiles, cement, food processing), agriculture (sugarcane, cocoa, coconuts, fruit, vegetables), tourism, fishing.

Foreign Trade: Exports - petroleum, sugar, cocoa, natural asphalt, chemicals.
Imports - steel, food, chemicals, machinery, vehicles.

Telecommunications: N/A

System Ownership: Government

Subdivision if Available: N/A

Regulatory Environment: Trinidad/Tobago External Telecommunication Co. Ltd.
(TEXTTEL)

Telephone Demographics²: 124,258

Transmission Facilities: N/A

¹In 1980 U.S. dollars.

²1983 data - no prior data available.

Virgin Islands

Country: Virgin Islands

L. America - Intelsat - Dependency Member

Data Year: 1980

General Location of Country: Located east of Puerto Rico. Made up of several islands with two major islands, St. Thomas and St. Croix.

Population: 71,236

Density: 207.1 persons/km²

Land Area: 344 km²

Language: English

Gross Domestic Product: Included as part of the United States GNP

Main Products: Tourism, manufacturing (rum, refined bauxite, petroleum, refining, textiles), agriculture (beef cattle, dairy products, poultry, vegetables, fruit, nuts).

Foreign Trade: Exports - petroleum, sugar, cocoa, natural asphalt, chemicals.
Imports - steel, food, chemicals, machinery, vehicles.

Telecommunications: N/A

System Ownership: N/A

Subdivision if Available: N/A

Regulatory Environment: FCC

Telephone Demographics: 37,667

Transmission Facilities: N/A

APPENDIX D
SATELLITE SYSTEMS STATUS AND PLANS
Argentina

The current Argentinian government has undergone a complete change in leadership in the last few years. This leadership change was from military rule to civilian democratic rule. Under the previous rule, there was serious discussion of implementation of a domestic satellite system. However, due to economic conditions, not only in Argentina but the rest of the world, these plans had to be set aside.

Argentina has been leasing transponder capacity from Intelsat since 1969 for domestic service. Currently, Argentina is leasing 1-1/2 transponders for this service.

The Argentinian government is again beginning to revisit the question of a domestic satellite system. In the current leased system, there are some 39 domestic earth stations and 3 devoted to international traffic.

Forecasted Domestic Transponder Demand for 1990 and 1995

	<u>Voice</u>	<u>Video</u>	<u>Total</u>
1990	1	2	3
1995	2.3	2	4.3

It is interesting that Argentina has twice as many telephones as does Colombia; however, the Argentina telecommunication have not advanced at the same rates or direction as Colombia. With its announced growth and modernization plan, Argentina could be developing its own domestic satellite system in the next 5 to 7 years. If and when they do establish a system, it would parallel in basic structure that of Brazil and Mexico, basically, a 2-satellite system on-orbit.

Brazil

Brazil, like Mexico, despite its problems, is developing into one of the more progressive Latin American countries with regards to its telecommunication

systems development. The Brazilian government has long been a member of Intelsat with regards to its international telecommunication traffic. Brazil began leasing domestic transponder capacity from Intelsat in 1975. In July of 1982, the Brazilian government formally filed an application for orbital slots for a domestic satellite system.

EMBRATEL, which is the Brazilian national telecommunication carrier, is a very progressive and forward-looking carrier. EMBRATEL, in addition to satellite communication, has built a significant domestic microwave network over the last 20 years. For those areas that are impractical to reach via microwave, a low-capacity troposcatter system was established or a satellite earth station was installed. Today, all Brazilian state capitals are linked by either high-capacity microwave or satellite.

In 1979, a study of Intelsat users, both domestic and international, showed that Brazil was the fourth¹ largest Intelsat user in the world. When this information became available, EMBRATEL studied its costs very closely, and it became evident that Brazil could in fact afford its own domestic satellite system. With the decreasing cost of satellite technology, increased capacity and capability increases were the factors which helped support the drive toward a domestic system. In terms of cost, EMBRATEL was paying Intelsat some \$2 million² annual lease cost per transponder for domestic service. EMBRATEL decided that it could purchase its own satellite system with 24 transponders for an annual cost of \$16 million² per satellite. It further calculated that the satellite would be paid for in approximately 8 years.

Brazil launched its first satellite in February 1985 aboard Ariane to a location of 70°W longitude. The second satellite is scheduled for launch either late 1985 or early 1986 to a location of 65°W longitude.

¹Satellite Communications, January 1984, p. 35, Berta Sichel.

²Satellite Communications, January 1984, P. 34, Berta Sichel.

Forecasted Domestic Transponder Demand for 1990 and 1995

	<u>Voice</u>	<u>Video</u>	<u>Total</u>
1990	13	8	21
1995	21	9	30

With the establishment of Brazil's own domestic satellite system, it will have the capability to reach the remote areas of the country with a vast array of telecommunications services. A study done by the Brazilian Commission of Space Studies indicated the following transponder allocation:³

1. 14 or 15 transponders for public usage (telephony, etc.);
2. 2 transponders for military communication;
3. 4 transponders for television;
4. 2 transponders for space applications; and
5. 1 transponder for high-speed data.

The Brazilian domestic satellite system is to be configured as follows:

1. Tracking, telemetry and control station located outside of Rio de Janeiro with the capability for control up to 3 satellites configured only for 2 presently. The station has a 14.2 meter antenna.⁴
2. The Advanced Publication of Information on a planned satellite network as filed with the IFRB indicates the following sized domestic earth stations will be utilized: 15 M, 10 M, 7.5 M, 6 M, and 5 M. It could be assumed that the traffic requirement of the served area will determine the size of the antenna installed.⁵
3. Brazil, however, will launch the second satellite in either September or December 1985 aboard Ariane. With this launch, Brazil will have an estimated excess capacity of 1-1/2 satellites or 36 transponders at a minimum.

³Satellite Communications, January 1984, p. 34, Berta Sichel.

⁴Design of the Brazilian domestic satellite system - SBTS, B. M. Berridge and N.M.G. Freitas paper presented at Satellite Communication Conference, Ottawa, Canada, June 14-17, 1983, p. 20.5.3.

⁵Special Section No. AR11/A/16 annex to I.F.R.B. Circular 1526, July 1982, p. 4.

Based upon all that is known at this time about the Brazilian satellite system, there will not be any additional requirements in terms of satellites in the near-term. In the early 1990's, thought will have to be given to replacements for the 2 existing satellites.

Canada

Canada has been one of the more progressive countries with regards to its telecommunication systems. Relative to satellite communication, the Canadians first communication satellite was launched in November of 1972. Since that time, there have been a series of satellites placed in orbit. Canada has an orbital arc assignment from 104.5° W to 117.5° W for fixed services. Presently, Canada has in-orbit the following satellites:⁶

<u>Satellite Name</u>	<u>Location</u>	<u>Launch Date</u>	<u>Freq. Band</u>	<u>Transponders</u>	<u>Equiv. 36 MHz Transponders</u>
Anik D-1	104.0°W	1982	C	24	24
Anik B-1	109°W	1978	C/Ku	12/6	24
Anik D-2*	114°W	1985	C	24	24
Anik C-2	105°W	1983	Ku	16	24
Anik C-3	117.4°W	1982	Ku	16	24
					96 transponders available not including Anik D-2 and B-1

*In-orbit storage and for sale

Forecasted Domestic Transponder Demand for 1990 and 1995

	<u>Voice</u>	<u>Video^a</u>	<u>Total</u>
1990	30	63	93
1995	42	71	113

^aCanadian Astronautics Limited, July 19, 1983, A Study of EHF Communication Requirements and Technology Development, p. 38, Table 15.

Canada is presently entering its second generation of communications satellites with significant excess capacity. This is evidenced by the fact that Canada has placed Anik D-2 for sale even though it is on-orbit. The

⁶The official Westsat Communication Satellite Channel Chart, January/February 1985, Vol. 5, No. 1.

original demand estimates for satellite addressable traffic have not grown at the original estimates, thus resulting in the excess capacity.

Based on 1985 transponder capacity of some 96 transponders with a transponder demand of 38 giving an available transponder capacity of 58. Even in 1995 there will be a forecasted excess capacity of some 40 transponders based upon present transponder availability.

In conclusion, it appears that with the five orbital slots already allocated to Canada and what they have in-orbit, no additional slots would be required. In terms of satellites, they have a sufficient number. The only communications satellite activity would be required will be replacements in 1988, 1992, 1993, and 1995.

Colombia

Colombia initiated international satellite service in 1978 utilizing Intelsat IV-A (F-2) through 3 international earth stations. Following this exercise, the Colombia government issued an RFP for a domestic satellite system. The government to date has not acted on the RFP, and it is believed to be a dead issue at this time.

In Colombia's RFP, the following requirements were listed:⁷

1. Two 24 transponder C-band satellites;
2. Six 13-meter type "A" earth stations to be co-located near major telephone exchanges;
3. Fourteen 13-meter type "B" earth stations to be co-located near smaller telephone exchanges;
4. One hundred fifty 4 to 5-meter type "C"-"D" to be located in the rural areas; and
5. Tracking, telemetry and control for the spacecraft.

⁷Satellite Marketing Digest - Satellite Systems Engineering, Inc., 1983, p. II/3.1.6.1-3.

Based upon Colombia's current Intelsat usage and the anticipated demand, it appears that a 1-satellite system would be more than adequate to handle all their needs through the mid to late 90's.

Forecasted Domestic Transponder Demand for 1990 and 1995

	<u>Voice</u>	<u>Video</u>	<u>Total</u>
1990	1.4	2	3.4
1995	2.5	3	5.5

Colombia has been involved in some discussion about establishing a regional system with its neighboring countries. This discussion has apparently terminated as little information is currently available.

Currently Colombia has some 18 domestic Intelsat earth stations in use and 2 for international usage.

Mexico

Mexico, despite its many problems, is developing into one of the more progressive Latin American countries with regard to its telecommunication systems. The Mexican government has long been a member of Intelsat with regard to its international telecommunications traffic. However, in 1981 the need to lease transponder space on Intelsat for domestic use was great. The factors leading up to this demand were many, but the tremendous overnight growth of the oil industry in Mexico really agitated this demand requirement. With the unavailability of terrestrial capacity and a domestic satellite, Mexico was forced to secure Intelsat transponders.

In the late 1970's, the Mexican government realized that it should develop a domestic satellite system to handle its growing telecommunication demand. This was accomplished, and Hughes was the successful bidder for the satellite part of the system. Additionally, Mexico planned to install some 2000⁸

⁸Satellite Marketing Digest, 1983, Satellite System Engineering, p. II 3.1.6.1-1.

domestic earth stations to support the system. Of the 2000, some 1600⁸ are planned to be devoted to rural towns which have no telephones or way of communicating with the rest of the world. Additionally, Mexico has ordered 80⁸ 7-meter receive-only earth stations from Scientific-Atlanta (SA) to be used with 10⁸ transmit/receive-only stations for a domestic television network. Presently, Mexico is leasing 1⁸ transponder on Western Union's Westar III for television service.

Forecasted Domestic Transponder Demand for 1990 and 1995

	<u>Voice</u>	<u>Video</u>	<u>Total</u>
1990	5	4	9
1995	10	5	15

Mexico filed for orbital slots as follows: (1) Morelos A at 113.5°W longitude; (2) Morelos B at 116.5°W longitude; (3) Ilhuicahu 3 at 141°W longitude; and (4) Ilhuicahu 4 at 145°W longitude. The Morelos series are scheduled for shuttle launch in 1985 and 1986. The Ilhuicahu series are still in the proposal stage and no launch dates have been set.

The proposed Mexican satellite system is quite extensive in its structure. A tracking, telemetry, and control station will be located on the outskirts of Mexico City. Additionally, Mexico is planning to use the satellite extensively for educational TV and television.

National Television Ground Station Network (1983)^a

<u>Region</u>	<u>Antenna Diameter</u>		
	<u>5 M</u>	<u>7 M</u>	<u>11 M</u>
Mexicali	1	6	1
Hermosillo	13	8	1
Culiacan	5	14	1
Guadalajara		19	1
Merida	11	7	2
Oaxaca		20	1
Chihuahua		10	2
Torreon		7	
Leon		13	
Monterey		10	1
Tampico		9	
Veracruz		3	
Zona Centro (Puebla)		11	
Zona Metropolitana	—	<u>1</u>	<u>6</u>
Total	30	138	16

^aMexico's First Domestic Satellite, Miguel E. Sanchez-Ruiz and Bruce R. Elbert, AIAA-84-0716, p. 316, Table 4.

Mexico currently is leasing 3 transponders from Intelsat at a cost of some \$2 million per transponder per year or about \$6 million per year plus what it is paying Western Union for the video service. With these kind of costs, it would appear that one could substantiate the establishment of a country-owned domestic satellite service. With a domestic system, there is additional capacity for little or no additional cost. In reviewing their various applications and projected usage, it appears that a one-satellite system would be more than adequate to meet total needs through 1995.

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16 Abstract <p>A study of current and future (to 1995) telecommunications activity within ITU Region 2 was performed by the Space Communications Division of NASA's Lewis Research Center. The primary objective of this study was to forecast the need for Fixed Service Satellites (FSS) by countries within ITU Region 2 excluding the United States and Greenland. As a part of this study, forecasts of telecommunications equipment needs were developed as a yardstick of the relative level of telecommunications activity among developing countries within the region. The study forecasts a likely scenario for the implementation of domestic and regional communications satellites to provide services to and among countries in ITU Region 2. By 1995, it is forecast that 15 fixed service satellites will be implemented as follows:</p> <table> <tbody> <tr> <td>Canada (domestic)</td> <td>5</td> </tr> <tr> <td>Mexico (domestic)</td> <td>2</td> </tr> <tr> <td>Brazil (domestic)</td> <td>2</td> </tr> <tr> <td>Colombia/Venezuela (regional)</td> <td>2</td> </tr> <tr> <td>Argentina/Chile regional)</td> <td>2</td> </tr> <tr> <td>South America and Caribbean (regional)</td> <td>2</td> </tr> </tbody> </table> <p>A forecast of these countries' requirements indicates that, with the possible exception of Canada, this constellation of satellites (with replacements as needed) will meet these countries' needs to beyond the year 2000.</p>						Canada (domestic)	5	Mexico (domestic)	2	Brazil (domestic)	2	Colombia/Venezuela (regional)	2	Argentina/Chile regional)	2	South America and Caribbean (regional)	2
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